UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604

DATE: MAY 14 2012

SUBJECT: Clean Air Act Inspection of Goodrich Landing Gear – Plating Operations
Cleveland, Ohio

FROM: Virginia Palmer, Environmental Engineer
Air Enforcement and Compliance Assurance Section (MN/OH)

THRU: Bill MacDowell, Chief WMM
Air Enforcement and Compliance Assurance Section (MN/OH)

TO: File

Date of Inspection April 10, 2012

Attendees
Virginia Palmer, EPA, Environmental Engineer
Katharina Bellairs, EPA, Environmental Engineer
Bryan Sokolowski, Cleveland DAQ, Environmental Enforcement Specialist
Jay Finegan, Goodrich, EHS Manager

Company Description and Background

Mailing Address: Goodrich Landing Gear, Plating Operations
2800 East 33rd Street
Cleveland, Ohio 44115

Phone Number: (216) 429-4525

Primary Contact: Jay Finegan, EHS Manager
(216) 429-4525

Purpose of Inspection

To assist in determining compliance with rules and regulations promulgated under the authority of the Clean Air Act.

Entrance and Opening Conference Summary

We (Virginia Palmer and Katharina Bellairs of U.S. EPA) arrived at Goodrich Landing Gear's plating facility, located in Cleveland, Ohio, ("the facility" or "Goodrich Plating") at approximately 9:30 AM on April 10, 2012. We met Bryan Sokolowski, an Environmental Enforcement Specialist with the Cleveland Division of Air Quality, outside the facility on 33rd street.

We waited at the security gate, which just has an intercom, for about 30 minutes before gaining access to the facility. Upon entry we were met by Jay Finegan, the EHS Manager for Goodrich Plating, and Anthony Lombardi, a Maintenance Manager for Goodrich Plating who was acting as Plant Manager at the time.

We told Mr. Finegan and Mr. Lombardi that we were there to do an unannounced inspection under the Clean Air Act and that we would do an opening conference, then a facility tour, and then have a closing conference. We were led to a Mr. Lombardi's temporary office for the opening conference. We were asked to sign-in at the receptionist's desk, which we did.

We then went into Mr. Lombari's office for the opening conference. We told them that if anything we discussed was considered confidential business information (CBI), they should let us know and we would treat it as such, and they said that they would. We asked them to give us an overview of the facility operations.

The facility representatives told us that the Goodrich Plating facility operates 3 shifts per day about 6 days per week, and employs 60 full-time employees.

Incoming parts have been coated in oil to prevent corrosion, so the first process for incoming parts is the degreaser. If the parts have been coated in heavy oil then the vapor degreaser, which uses trichloroethylene (TCE) is used, whereas if they have been coated in light oil then an aqueous solution of sodium hydroxide is used. The vapor degreaser has one refrigeration system to keep it cool. The system has two independent sections that can run simultaneously, one of which uses R-404A and the other of which uses R-507. The facility representatives explained that the current chiller had replaced an old chiller within the past year. They said that the old chiller had a diverter mode for the two sections, so that only one or the other section could be on at a time. They also said that the cadmium line has a chiller that uses R-22. However, they did not think that it was larger than 50 pounds, and they were sure that the refrigeration system for the vapor degreaser was not larger than 50 pounds. They also explained that the TCE is heated to about 185°F, but the vapor blanket over the TCE tank is cooled to less than -5°F per state regulations.

The next process is the shot peen, which is used for surface hardening. For some parts that Goodrich Plating processes, this is the only process they undergo before being sent back out as a finished product. For parts that are getting plated, the next process is "grip blast." This uses an air hose at 50 – 60 psi to spray aluminum oxide against the part and get it very clean. Once the part has gone through grip blast it needs to get coated within about 4 hours because it will start rusting very quickly when it is that clean. After that is a process called stop-off. In this area, operators use tape to cover the sections of the part that they do not want to get plated. Goodrich has chromium, nickel and cadmium plating operations. The facility operators told us that some parts will get coated with only nickel or only cadmium while some will get coated with more than both nickel and chromium (on different areas of the part), and then the parts not coated with nickel or chromium will usually get coated with cadmium. After a part is plated with nickel or chromium it will go to an oven for a bake cycle. The bake cycle typically lasts 11 – 23 hours. The oven operates at 375°F and is natural-gas-fired. The maximum temperature of the oven is 555°F – if the oven reaches this temperature, it will shut off. They ovens do not have any emission controls, but the facility representatives told us that they have mercaptan filters on the inbound side.

After nickel and chromium plating the parts go to polishing to remove excess chromium and nickel or to improve the cosmetics, and they then continue on to cadmium plating, if necessary. After cadmium plating, the parts get a final inspection and are then shipped out.

The facility representatives told us that at the time we were there, only 4 or 5 of the chromium tanks were in use, though they have 9 that are permitted. They explained that three of the tanks were empty (tanks 1, 2F and 2B) and one had been permanently converted for another use. They also have a tank 3, which was removed a long time ago and was no longer included in the permit. They also said that they have two scrubbers on the chromium tanks to control air emissions. One scrubber, called the south scrubber, was only controlling tank 7 at the time because the other tanks that it controls were not operating. The south scrubber and the tanks it controls are grouped together as Emission Unit P001 in the facility's Title V permit. They said that they aren't using all the chromium plating tanks because they had had less demand for chromium plating than in previous years, and they indicated that they were currently doing more nickel plating, though they did not expect that trend to persist. The other scrubber, the north scrubber, controls tanks 8 – 11. This system is known as Emission Unit P002 in the Title V permit. They also have two vertical composite mesh pad mist eliminators before the scrubbers.

The facility representatives told us that it had been announced that United Technologies Company was buying Goodrich and that the deal was expected to close in the fall of 2012, so they did not know how they would affect their future operations. We asked about their relationship with BF Goodrich, and they said that they had been one company in the 1980s but they split up and then Michelin bought BF Goodrich.

We were then joined by James Mihalo, a Maintenance Supervisor. We asked about performance testing on the air emission control systems for the chromium tanks. They said that they had done a test within the last week but they did not have those results back yet. Their last test on P001 had been done in January 2007, with results of 0.002 milligrams of chromium per dry standard cubic meter (mg/dscm). They said that they we operating at 2.3 inches of water during the test. We received a copy of the test report (Attachment 1). They told us that they had been maintaining the pressure drop across the scrubber at 2.3 +/- 1 inch, but since the regulations had recently changed to allow them to maintain the system at +/- 2 inches, they would comply with that requirement instead. They also told us that the results of their last test on P002 showed emissions of 0.0024 mg/dscm at 2.3 inches of water.

We asked how the facility takes its pressure drop readings and they told us that they have a computerized system that takes 5 readings each day. They said that they are going to be replacing this system with a data logger within a few months, and that the data logger would take more data points than the current system.

The facility representatives mentioned that the vapor degreaser had not been operating during Mr. Sokolowski's last inspection, and he concurred. They said that it had developed a leak so they removed the TCE until the leak could be fixed. The leak was the result of the wells becoming corroded, so the wells were replaced between July and September 2011 and the vapor degreaser restarted around November or December 2011. They said that while the vapor degreaser was not operating they used the aqueous wash to degrease all the parts, though it did not work well on the parts that had been coated with heavy oils.

We asked about the 2010 actual emissions and Mr. Sokolowski showed us that Goodrich Plating had emitted about 8.8 tons of TCE in 2010, based on use. This information was recorded in his inspection report from the previous year, which he gave us a copy of (Attachment 2). We asked how the TCE emissions are determined and the facility representatives told us that the maintenance operators record every addition to the TCE tank. They reclaim some TCE and send it off-site as hazardous waste for processing, so they remove that amount from their calculation. When removing this amount from the amount of TCE used, they assume that 50% is TCE and 50% is sludge. They said that this is not based on a tested value but that they believe it is a conservative estimate because sometimes it is mostly TCE but they still assume it is 50% sludge and thus deduct less than they could. Also, they assume that everything that is used in the tank is emitted as organic carbon emissions. They told us that they monitor how much nickel and chromium comes in and goes into the tanks for specification and quality control purposes but they are not required to do so.

We asked for copies of quarterly deviations reports (Attachment 3) and some of the pressure drop readings data (Attachment 4). We also asked for a copy of the summary page of the 2010 annual emission report (Attachment 5). Lastly, we asked for a summary sheet of the TCE used versus the TCE taken offsite (Attachment 6).

Inspection Observations/Summary

We started the facility tour around 10:40 AM. We started in the shipping and receiving area. Nearby was also the finished parts area, which we saw. We saw the grip blast and shot peen processes. The facility representatives told us that the shot peen could be made out of various materials such as cut wire or glass balls. They said that some of the processes are manual and some are automatic.

Next we saw the ovens that are used after the part has been plated. The facility representatives told us that the ovens are needed to prevent hydrogen embrittlement after plating. Then we saw the stop-off area, which is mostly a manual process.

We proceeded to the nickel plating area. Goodrich Plating has both sulfamate nickel and electroless nickel plating. If a part is getting plating with sulfamate nickel, it first goes to a sulfuric hydrofluoric acid tank, which we saw. We also saw the sulfamate nickel tank, which uses an electric current to plate the parts. Next to the sulfamate nickel tank were the electroless nickel tanks. The facility representatives told us that the electroless nickel tanks plate everything in the tank, including the parts of the tank, so they need to be emptied and cleaned every 3 – 4 weeks with nitric acid to remove the nickel plating from the tanks. Goodrich Plating also has an "experimental" nickel plating tank, which we saw.

Next we saw the vapor degreaser. We observed the tank using the FLIR GF 320 camera as a part was loaded out of the vapor degreaser tank and did not see any escaping hydrocarbon emissions.

Next we saw the chrome plating area. We observed how tanks 8 – 11 were ducted to a common header that went off to the right, whereas tank 7 was ducted to the left. We saw the chrome rinse tanks, which were located right in front of the chrome plating tanks and were uncovered. Two of the chrome plating tanks have a sulfuric hydrofluoric acid rinse tank after the chrome rinse tank, but the other tanks do not have this step. The facility representatives explained that air is pulled to the sides of the chrome tank and then ducted to the header. We did not observe any emissions escaping from the chrome tanks, which were uncovered. We could see the mist eliminators on the ducting above the chrome tanks. We saw that Tank 11 had a hot rinse tank instead of a cold rinse tank, as the other tanks had, and we could see steam coming off the hot rinse tank.

We then went to the cadmium plating area. The facility representatives explained that the parts first go to a water rinse and then to the titanium cadmium tank or the low-hydrogen embrittlement cadmium tank. After the cadmium plating tank the part goes to the rinse, then to a chromic acid neutralizer, then to a cold rinse, then to a chromate conversion tank, and finally to two rinse tanks, one cold and one hot. The facility representatives told us that the cadmium tanks goes to the atmosphere.

We asked about the age of the facility and were told that the scrubbers on the chrome plating tanks went in around 1993, the lower part of the nickel room went in around 2006, and the rest of the facility was probably older than the 1990s. We saw oven 1, which has a heat input capacity of 1.5 million British thermal units per hour.

Next we saw the chrome and cadmium strip tanks and the hot rinse tanks associated with those strip tanks. The facility representatives explained that those are used when the plating has to be removed. They said that the chrome strip tank uses a sodium hydroxide reverse plating process whereas the cadmium strip tank uses ammonium nitrate. At this time we saw chrome tanks 1, 2B and 2F, which are no longer chrome plating tanks according to the facility representatives. Tank 1 was empty but tanks 2B and 2F had material in them.

We then proceeded to the polish area and then saw oven 3. We asked about oven 2, and Mr. Sokolowski recalled that it had been removed in the 1990s. We were told that oven 3 is the same capacity as oven 1.

Next we saw the aqueous wash system, a drum of heavy oil, and a container of light oil. The facility representatives mentioned that they have a wastewater treatment plant on-site, so we went to look at it. They told us that if they have hexavalent chromium, they reduce it to trivalent chromium and try to remove it as a solid from the wastewater before discharging to the sewer. They also said that if they have cyanides in the water, they remove those by reducing them. They have separate tanks to treat the chromium and the cyanide. Once any chromium or cyanide has been removed, the wastewater goes to the neutralization tanks, where the pH is adjusted, and then coagulants and polymers are added and precipitated out. Lastly the wastewater goes through a filter press before it is discharged to the sewer. The solids from the filter press go through a dryer and then get sent out as hazardous waste.

We proceeded upstairs to the "rack room," where tooling is built. A small lead pot is located in this area. The pot holds about 15 pounds of lead, according to the facility representatives, and it operates batch cycles. They said that they bring in fresh lead as ingots or bars, but that they also sometimes will melt down an old part. The operator in this area opened the top of the lead pot to show us the molten lead which had a thin layer of slag over it. He pointed out the exhaust system over the lead pot and the lead mold. We saw that the ducting lead to a baghouse. The facility representatives were unsure about the maintenance schedule for the baghouse.

Lastly, we went to see the scrubbers. We saw that the pressure drop across P001 at 11:30 AM was approximately 3.8 inches of water. We saw that the pressure drop across P002 was approximately 3 inches of water. We finished the tour at approximately 11:40 AM.

Records Review and Closing Conference

We went to an office area to review some records. We reviewed the Operation and Maintenance plan for the chrome tank scrubbers and got a copy of it (Attachment 7). We also got a copy of a record of some of the instances that the north or south scrubber pressure drop deviated from its required range (Attachment 8).

While reviewing the records, Mr. Sokolowski mentioned that he had previously looked into the lead emissions from the lead pot and that they had determined that the emissions were approximately 0.002 pounds of lead per ton of lead melted, and that historically Goodrich Plating has used only about 2 tons of lead each year. He also said that they are considered a tertiary smelter. He mentioned that the facility may be subject to 40 C.F.R. Part 63, Subpart WWWWWW, for Plating and Polishing Operations, but it would not be included in Goodrich Plating's Title V Permit because the State of Ohio does not have delegation over that rule. He later informed us via phone that the facility is considered a major source of hazardous air pollutants and thus is not covered by this subpart, which is only applicable to area sources.

Mr. Lombardi informed us that they process approximately 150 parts per month, in response to our earlier question about their production rate. After getting copies of the documentation we had reviewed, we returned back to Mr. Lombardi's office for the closing conference.

We started the closing conference at approximately 12:30 PM. We thanked the facility representatives for taking the time to meet with us and take us on the plant tour. We told them that we would generate an inspection report and that they could request a copy via email. We told them that they may receive a Section 114 Information Request as a follow-up to the inspection. We thanked them again for their time and left the plant at approximately 12:45 PM.

Attachments

Attachment 1: January 2007 Test Report
Attachment 2: CDAQ's January 25, 2011 Inspection Report
Attachment 3: Quarterly Deviations Reports
Attachment 4: Pressure Drop Readings
Attachment 5: 2010 Annual Emissions Report Summary
Attachment 6: TCE Used Versus Sent Off-Site
Attachment 7: Operation and Maintenance Plan for Chrome Tank Scrubbers
Attachment 8: Pressure Drop Deviations

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October 23, 2007

Greg Goga
Goodrich Landing Gear-Plating Operations
2800 E 33rd St.
Cleveland, Ohio 44115-3602

Dear Greg:

The following report provides the results of the compliance emission testing conducted on September 27, 2007. These results are a product of the application of the U.S. EPA Stationary Source Sampling Methods listed in 40 CFR Part 60 Appendix A and Part 63 Appendix A that were in effect at the time of this test.

Please mail one copy of this report along with any other supportive process operating data collected during this test to your local EPA representative within 30 days of the actual test day. You should also attach a cover letter (on company letterhead) stating the purpose and the outcome of this test. Additionally, you may address, preferably in a timetable format, any obligations or implications that might be necessary to achieve environmental compliance because of the result of this test.

Please do not hesitate to call if you have any questions or concerns about these test results. On behalf of Air Compliance Testing, I would also like to personally thank you for the opportunity to work with you on this testing project and would enjoy the opportunity to work with you again on any additional future testing projects.

Sincerely,

Phaneendra Uppalapati
Air Quality Engineer

Robert J. Lisy, Jr.
Quality Assurance Officer

Table of Contents

1.0 INTRODUCTION

1.1 Summary of Test Program

Goodrich Landing Gear-Plating Operations (Facility ID: 13-18-00-5949), located in Cleveland, Ohio contracted Air Compliance Testing, Inc. of Cleveland, Ohio to conduct compliance stack emission testing for their Hard Chrome Electroplating Tanks 1, 2B, and 2F (P001) and Hard Chrome Electroplating Tanks 8 - 11 (P002). Testing was performed to satisfy the emission testing requirements pursuant to Goodrich Landing Gear-Plating Operations Ohio EPA Title V permit. The testing was performed on September 27, 2007.

Sampling was performed at the P001 Scrubber Exhaust Stack and at the P002 Scrubber Exhaust Stack to determine the concentration of total chromium. Testing was conducted while operating P001 and P002 at normal, maximum rectifier outputs. During this test, emissions from P001 and P002 were each controlled by individual scrubbers.

The test methods that were conducted during this test were EPA Methods 1, 2, 4, and 306.

1.2 Key Personnel

The key personnel who coordinated this test program (and their phone numbers) were:

Greg Goga, BF Goodrich Plating, 216-241-5913

David Hearne, Chief of Air Pollution Engineering Section, CDPH, 216-664-2178

Philip J. Billick, President, Air Compliance Testing, Inc. 800-372-2471

Alan C. Schreiner, Executive Vice President, Air Compliance Testing, Inc. 800-372-2471

2.0 SUMMARY AND DISCUSSION OF TEST RESULTS

2.1 Objectives and Test Matrix

The purpose of this test was to determine the concentration of total chromium at the P001 Scrubber Exhaust Stack and at the P002 Scrubber Exhaust Stack while operating P001 and P002 at normal, maximum rectifier outputs. Testing was performed to satisfy the emission testing requirements pursuant to Goodrich Landing Gear-Plating Operations Ohio EPA Title V permit.

The specific test objectives for this test were to:

Measure the concentration of total chromium at the P001 Scrubber Exhaust Stack and at the P002 Scrubber Exhaust Stack while operating P001 and P002 at normal, maximum rectifier outputs.

Measure the dry standard and actual volumetric flow rate of the stack gas at the P001 Scrubber Exhaust Stack and at the P002 Scrubber Exhaust Stack while operating P001 and P002 at normal, maximum rectifier outputs.

Table 2.1 presents the sampling and analytical matrix log for this test.

2.2 Field Test Changes and Problems

No field test changes or problems occurred during the performance of this test that would bias the accuracy of the results of this test.

2.3 Presentation of Results

A single sampling train was utilized during each run at each location to determine the concentration of total chromium at the P001 Scrubber Exhaust Stack and at the P002 Scrubber Exhaust Stack while operating P001 and P002 at normal, maximum rectifier outputs. These sampling trains measured the stack gas volumetric flow rate, moisture content, and concentration of total chromium.

Table 2.2 displays the concentraion of total chromium measured at the P001 Scrubber Exhaust Stack and at the P002 Scrubber Exhaust Stack while operating P001 and P002 at normal, maximum rectifier outputs.

			EPA TEST METHODS UTILIZED		
			M1/M2 (Flow)	M4 ($\%H_2O$)	M306 (Total Chromium)
Date	Run No.	Sampling Location	Sampling Time / Duration (min)	Sampling Time / Duration (min)	Sampling Time / Duration (min)
9/27/2007	1	P001 Scrubber Exhaust Stack	8:26 - 10:36 120	8:26 - 10:36 120	8:26 - 10:36 120
9/27/2007	2	P001 Scrubber Exhaust Stack	10:52 - 13:03 120	10:52 - 13:03 120	10:52 - 13:03 120
9/27/2007	3	P001 Scrubber Exhaust Stack	13:38 - 16:01 120	13:38 - 16:01 120	13:38 - 16:01 120
9/27/2007	1	P002 Scrubber Exhaust Stack	8:26 - 10:36 120	8:26 - 10:36 120	8:26 - 10:36 120
9/27/2007	2	P002 Scrubber Exhaust Stack	10:52 - 13:03 120	10:52 - 13:03 120	10:52 - 13:03 120
9/27/2007	3	P002 Scrubber Exhaust Stack	13:38 - 16:01 120	13:38 - 16:01 120	13:38 - 16:01 120

All times are Eastern Daylight Time.

Table 2.1 - Sampling and Analytical Matrix

	P001 Scrubber Exhaust Stack				P002 Scrubber Exhaust Stack			
	Run 1	Run 2	Run 3	Average	Run 1	Run 2	Run 3	Average
Total Chromium Concentration (mg/dscm)	0.0020	0.0024	0.0017	0.0020	0.0027	0.0021	0.0025	0.0024
Stack Gas Average Flow Rate (acfm)	35,487	35,703	35,722	35,637	35,852	35,429	35,156	35,479
Stack Gas Average Flow Rate (scfm)	34,019	34,169	34,201	34,130	34,241	33,902	33,642	33,928
Stack Gas Average Flow Rate (dscfm)	33,199	33,398	33,446	33,347	33,346	33,077	32,858	33,094
Stack Gas Average Velocity (fpm)	2,848	2,865	2,867	2,860	2,907	2,873	2,851	2,877
Stack Gas Average Static Pressure (in-H_2O)	-0.40	-0.55	-0.51	-0.48	-0.29	-0.33	-0.31	-0.31
Stack Gas Average Temperature (°F)	75	76	76	76	78	77	77	77
Stack Gas Percent by Volume Moisture (%H_2O)	2.41	2.26	2.21	2.29	2.61	2.43	2.33	2.46
Measured Stack Inner Diameter (in)*	47.80	47.80	47.80	47.80	47.5 x 47.6	47.5 x 47.6	47.5 x 47.6	47.5 x 47.6

*The P002 Scrubber Exhaust Stack was elliptical in shape

Table 2.2 - Emission Results

3.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

3.1 Process Description and Operation

BF Goodrich Landing Gear-Plating Operations is a manufacturing plant specializing in Aircraft Components & Supplies. Hard Chrome Electroplating Tanks 1, 2B, and 2F (P001) and Hard Chrome Electroplating Tanks 8 - 11 (P002) were in operation during the performance of this test event.

Figures 3.1 and 3.2 depict the process schematic.

3.2 Control Equipment Description

During this test, emissions from P001 and P002 were each controlled by individual scrubbers.

3.3 Flue Gas Sampling Locations

<u>3.3.1 - P001 Scrubber Exhaust Stack</u>
The P001 Scrubber Exhaust Stack had a measured inner diameter of 47.8-inches, was oriented in the vertical plane, and was accessed from a temporary scaffolding arrangement. Two (2) 3.5-inch I.D. sampling ports were located 90° apart from one another at a location that met EPA Method 1, Section 11.1.1 criteria. Prior to emissions sampling, the stack was traversed to verify the absence of cyclonic flow. An average yaw angle of 15.42° was measured. Therefore, the sampling location also met EPA Method 1, Section 11.4.2 criteria. During emissions sampling, the stack was traversed for stack gas volumetric flow rate, moisture content, and total chrome concentration determination.

<u>3.3.2 - P002 Scrubber Exhaust Stack</u>
The P002 Scrubber Exhaust Stack was elliptical in shape with measured inner diameters of 47.5-inches and 47.6-inches. The stack was oriented in the vertical plane and was accessed from a temporary scaffolding arrangement. Two (2) 3.5-inch I.D. sampling ports were located 90° apart from one another at a location that met EPA Method 1, Section 11.1.1 criteria. Prior to emissions sampling, the stack was traversed to verify the absence of cyclonic flow. An average yaw angle of 14.63° was measured. Therefore, the sampling location also met EPA Method 1, Section 11.4.2 criteria. During emissions sampling, the stack was traversed for stack gas volumetric flow rate, moisture content, and total chrome concentration determination.

Figures 3.3 and 3.4 schematically illustrate the traverse point and sample port locations utilized.

3.4 Process Sampling Location

The EPA Reference Test Methods performed did not specifically require that process samples were to be taken during the performance of this testing event. It is in the best knowledge of Air Compliance Testing that no process samples were obtained and therefore no process sampling location was identified in this report.

See Goodrich Landing Gear-Plating Operations personnel for any process sampling locations which may have been utilized unknowingly to Air Compliance Testing, Inc. during this testing event.

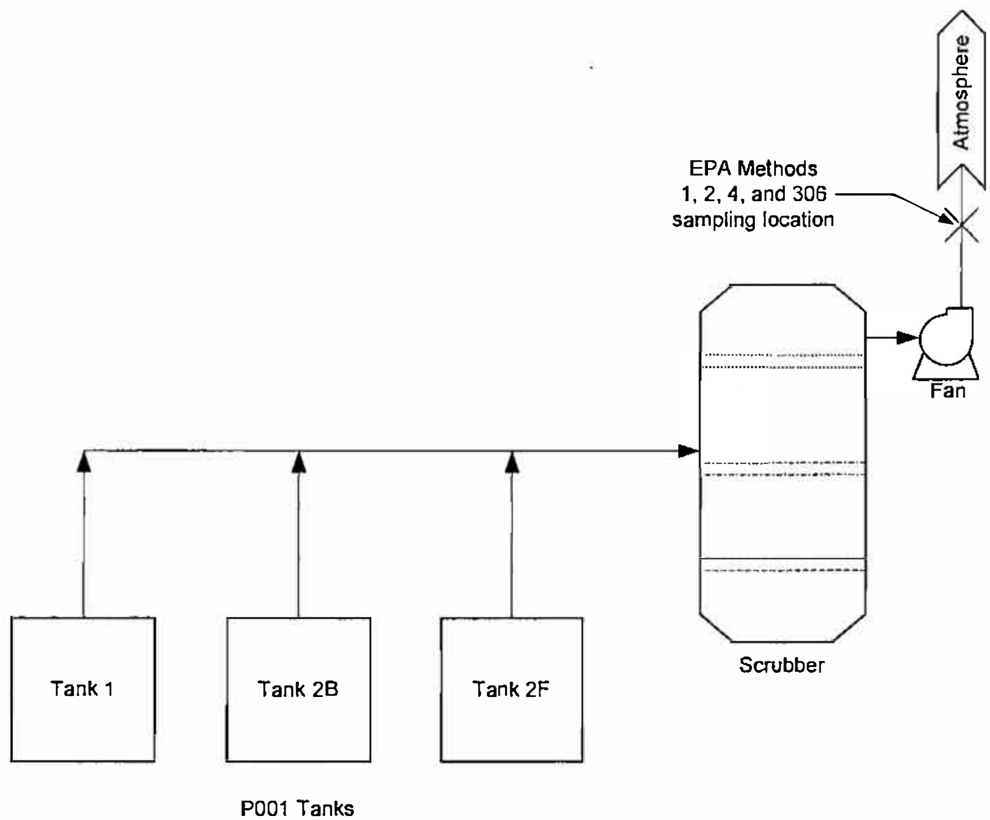


**Figure 3.1 - Hard Chrome Electroplating Tanks 1, 2B, and 2F (P001)
Process Schematic**

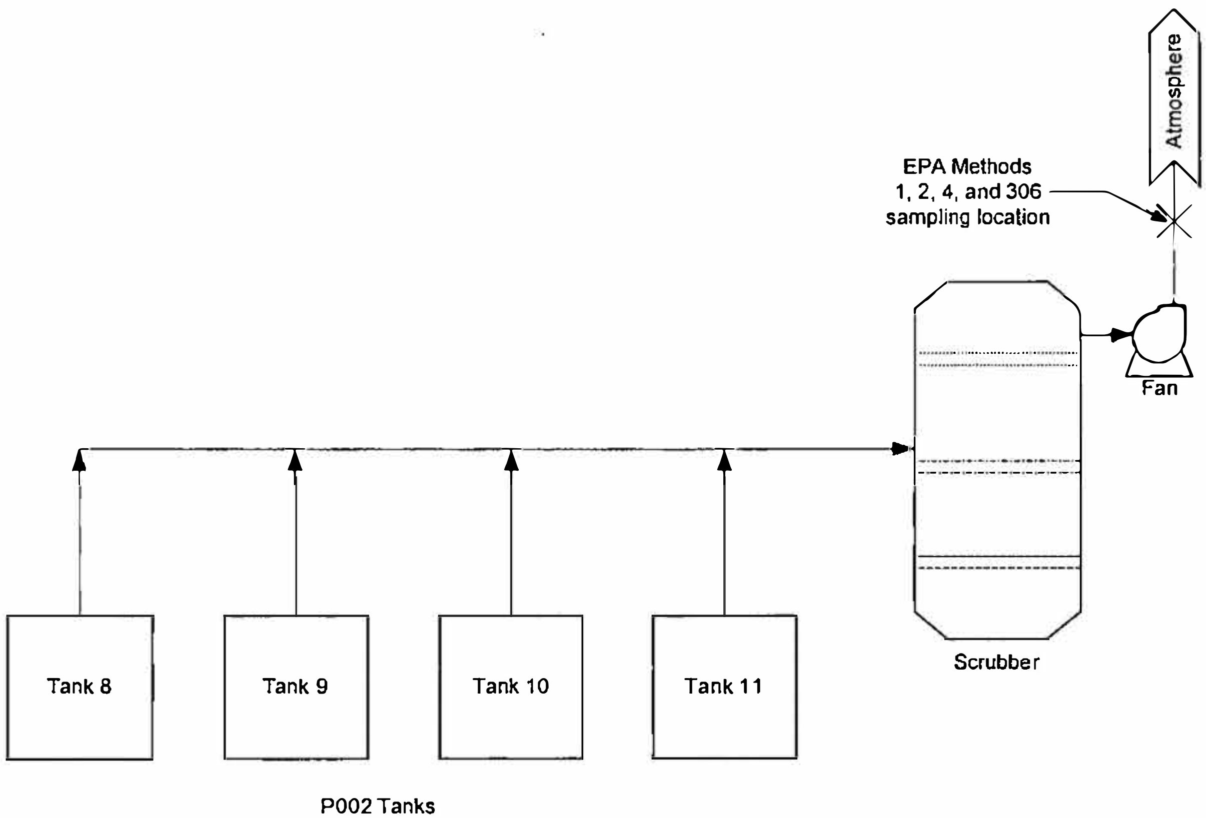
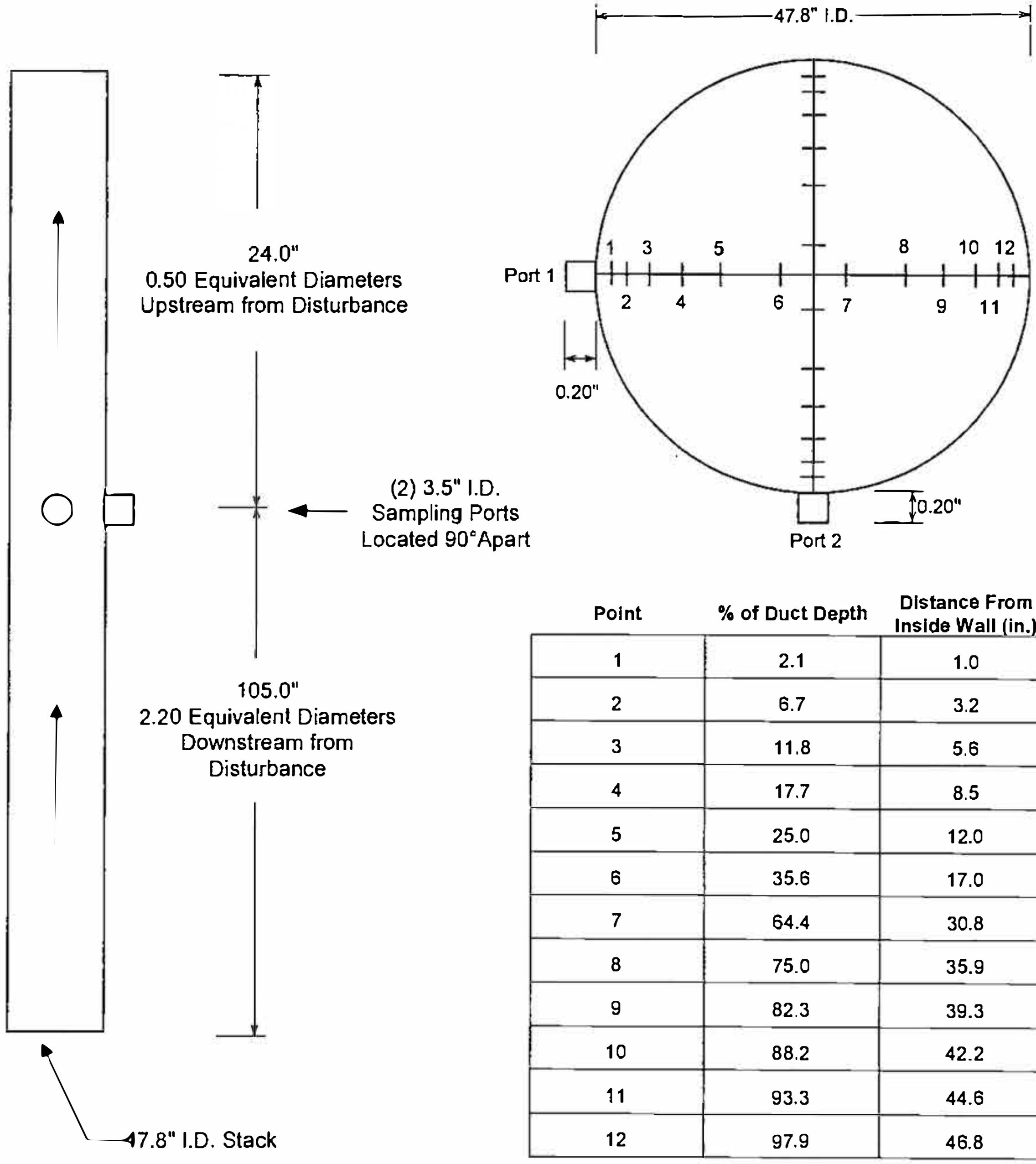
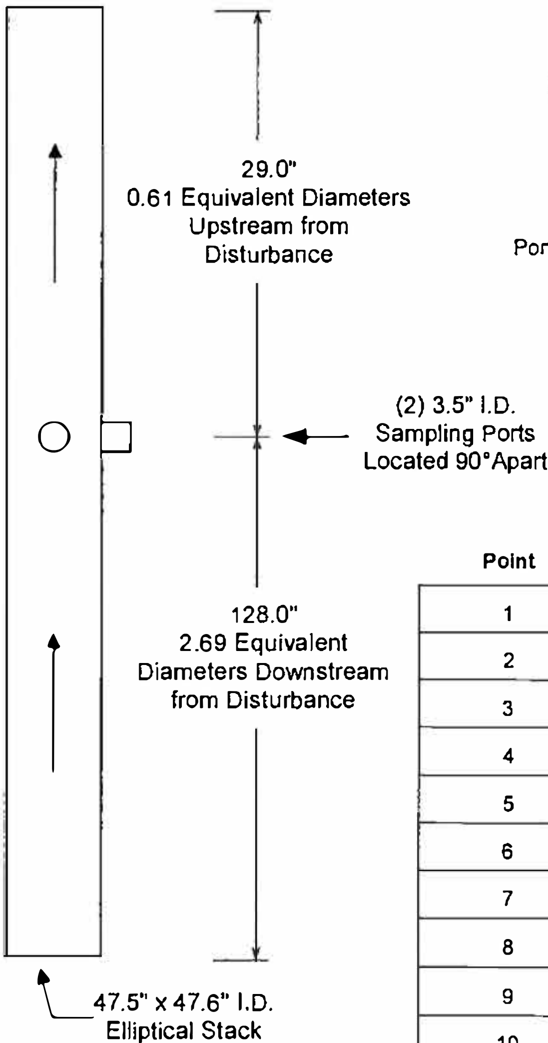


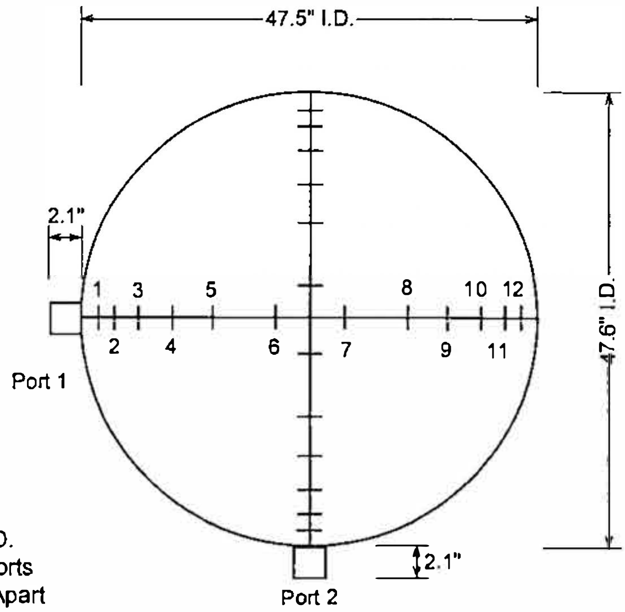
Figure 3.2 - Hard Chrome Electroplating Tanks 8 - 11 (P002) Process Schematic



Point	% of Duct Depth	Distance From Inside Wall (in.)
1	2.1	1.0
2	6.7	3.2
3	11.8	5.6
4	17.7	8.5
5	25.0	12.0
6	35.6	17.0
7	64.4	30.8
8	75.0	35.9
9	82.3	39.3
10	88.2	42.2
11	93.3	44.6
12	97.9	46.8

Figure 3.3 - P001 Scrubber Exhaust Stack Traverse Point Location Drawing





Point	% of Duct Depth	Distance From Inside Wall (in.) Port 1	Distance From Inside Wall (in.) Port 2
1	2.1	1.0	1.0
2	6.7	3.2	3.2
3	11.8	5.6	5.6
4	17.7	8.4	8.4
5	25.0	11.9	11.9
6	35.6	16.9	16.9
7	64.4	30.6	30.7
8	75.0	35.6	35.7
9	82.3	39.1	39.2
10	88.2	41.9	42.0
11	93.3	44.3	44.4
12	97.9	46.5	46.6

Figure 3.4 - P002 Scrubber Exhaust Stack Traverse Point Location Drawing

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 Test Methods

4.1.1 EPA Method 1: Sample and Velocity Traverses for Stationary Source
Principle: To aid in the representative measurement of pollutant emissions and/or total volumetric flow rate from a stationary source, a measurement site where the effluent stream is flowing in a known direction is selected, and the cross-section of the stack is divided into a number of equal areas. A traverse point is then located within each of these equal areas. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

4.1.2 EPA Method 2: Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S)
Principle: The average gas velocity in a stack is determined from the gas density and from measurement of the average velocity head with a Type S (Stausscheibe or reverse type) pitot tube. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

4.1.3 EPA Method 4: Determination of Moisture Content in Stack Gases
Principle: A gas sample is extracted at a constant rate from the source; moisture is removed from the sample stream and determined either volumetrically or gravimetrically. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 60, Appendix A.

4.1.4 EPA Method 306: Determination of Chromium Emissions from Decorative and Hard Chromium Electroplating and Anodizing Operations
Principle: Emissions are collected from the source by using a Method 5 sampling train (40 CFR Part 60, Appendix A), with the filter omitted and a glass nozzle and probe liner. The chromium emissions are collected in an alkaline solution: 0.1N sodium hydroxide (NaOH) or 0.1 N sodium bicarbonate ($NaHCO_3$). The collected samples remain in the alkaline solution until analysis. The chromium sample is analyzed using inductively coupled plasma emission spectrometry (ICP) at 267.72 nm. Alternatively, if improved detection limits are required, a portion of the alkaline impinger solution is digested with nitric acid and analyzed by graphite furnace atomic absorption spectroscopy (GFAAS) at 357.9 nm. This method was utilized in its entirety as per the procedures outlined in 40 CFR Part 63, Appendix A.

The sampling train utilized during this testing project is depicted in Figure 4.1.

4.2 Procedures for Obtaining Process Data

Process data was recorded by Goodrich Landing Gear-Plating Operations personnel utilizing their typical record keeping procedures. Recorded process data was provided to Air Compliance Testing, Inc. personnel at the conclusion of this test event. The process data is located in the Appendix.

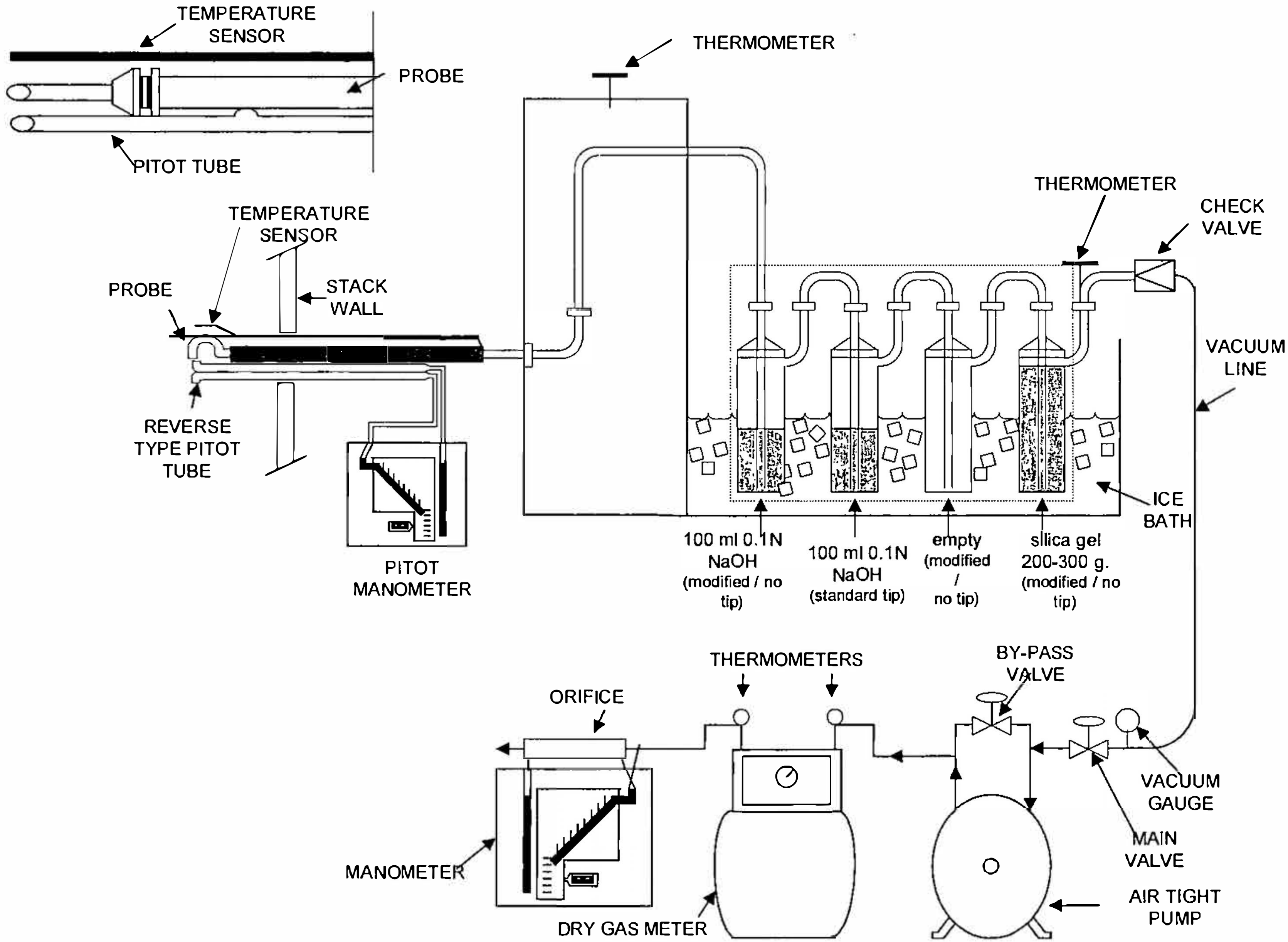


Figure 4.1 - EPA Method 306 Sampling Train Schematic

5.0 INTERNAL QA/QC ACTIVITIES

5.1 QA Audits

Tables 5.1 and 5.2 illustrate the QA audit activities that were performed during this test.

All meter boxes and sampling trains used during sampling performed within the requirements of their respective methods as is shown in Tables 5.1 and 5.2. All pre-test and post-test leak checks were well below the applicable limit. Minimum metered volumes and percent isokinetics were also met where applicable.

5.2 QA/QC Problems

No QA/QC problems occurred during this test event.

Method 306 Sampling Train	P001 Scrubber Exhaust Stack Run 1	Run 2	Run 3
Leak Rate Observed (Pre/Post) (cfm)	0.001 / 0.001	0.001 / 0.000	0.001 / 0.001
Applicable Method Allowable Leak Rate (cfm)	< 0.020	< 0.020	< 0.020
Acceptable	Yes	Yes	Yes
Volume of Dry Gas Collected (dscf)	79.946	81.456	78.932
Recommended Volume of Dry Gas Collected (dscf)	60.000	60.000	60.000
Acceptable	Yes	Yes	Yes
Percent of Isokinetic Sampling Rate (%)	97.4	95.1	95.4
Applicable Method Allowable Isokinetic Sampling Rate (%)	100 ± 10	100 ± 10	100 ± 10
Acceptable	Yes	Yes	Yes

Method 306 Sampling Train	P002 Scrubber Exhaust Stack Run 1	Run 2	Run 3
Leak Rate Observed (Pre/Post) (cfm)	0.001 / 0.001	0.003 / 0.003	0.002 / 0.001
Applicable Method Allowable Leak Rate (cfm)	< 0.020	< 0.020	< 0.020
Acceptable	Yes	Yes	Yes
Volume of Dry Gas Collected (dscf)	76.594	78.143	76.110
Recommended Volume of Dry Gas Collected (dscf)	60.000	60.000	60.000
Acceptable	Yes	Yes	Yes
Percent of Isokinetic Sampling Rate (%)	95.4	99.0	96.2
Applicable Method Allowable Isokinetic Sampling Rate (%)	100 ± 10	100 ± 10	100 ± 10
Acceptable	Yes	Yes	Yes

Table 5.1 - EPA Method 306 Sample Train Audit Results Table

P001 Scrubber Exhaust Stack				
Pre-Test Dry Gas Meter Calibration Factor (Y)	Average Post-Test Dry Gas Meter Calibration Check Value (Yqa)	Post Test Dry Gas Meter Calibration Check Value Difference From Pre-Test Calibration Factor (%)	Applicable Method Allowable Difference (%)	Acceptable
1.0154	1.0483	3.24%	5.00%	Yes

P002 Scrubber Exhaust Stack				
Pre-Test Dry Gas Meter Calibration Factor (Y)	Average Post-Test Dry Gas Meter Calibration Factor (Y)	Post Test Dry Gas Meter Calibration Factor Difference From Pre-Test Calibration Factor (%)	Applicable Method Allowable Difference (%)	Acceptable
0.9957	0.9956	-0.01%	5.00%	Yes

Table 5.2 - EPA Method 306 Dry Gas Meter Audit Results Table

6.0 APPENDIX

Appendix attached.

APPENDIX

to

Compliance Stack Emission Test Report

Determination of Total Chromium Emissions

Hard Chrome Electroplating Tanks 1, 2B, and 2F (P001) and Hard Chrome Electroplating Tanks 8 - 11 (P002)

EPA Methods 1, 2, 4 and 306

Goodrich Landing Gear-Plating Operations
Cleveland, Ohio

Date Conducted: September 27, 2007
Job Number: 070920

Prepared by:
Air Compliance Testing, Inc.
PO Box 41156
Cleveland OH 44141-0156
Phone: (800) EPA-AIR1 (372-2471)

Report Date: October 23, 2007

	North Scrubber Stack (amp-hour)	South Scrubber Stack (amp-hour)
Run 1	1065.31	2668.03
Run 2	276.28	0.00
Run 3	542.97	6466.90

First Analytical Laboratories

ANALYSIS REPORT

Method 306; Total Chromium

Project # 070920

Prepared for:

Air Compliance Testing
5525 Canal Road
Valley View, OH 44125

Reviewed and Approved by:

W H Wadlin

William H. Wadlin, Ph. D.
Laboratory Manager

October 4, 2007

Do not reproduce this report except in whole without the permission of the laboratory.

First Analytical Laboratories

CASE NARRATIVE

Project #: 71001 Report Date: 04-Oct-07
Client: Air Compliance Testing
Client Project ID: 070920

Samples:

Seven samples were submitted for determination of total chromium by Method 306. One of these was the blank. All of the samples were received in good condition, with no apparent leakage. The remaining amounts of the samples and digestates will be retained by the laboratory for six months and then discarded.

Preparation:

The samples were prepared and analyzed according to EPA Method 306, *Determination of Chromium Emissions from Decorative and Hard Chromium Electroplating and Anodizing Operations*. A lab blank, a pre-digestion spike and a pre-digestion duplicate were prepared along with the samples.

Analysis:

Total chromium was determined by Graphite Furnace Atomic Absorption Spectrophotometry (GFAA).

Results:

The results are presented as total micrograms of chromium present in the whole sample indicated. Chromium was measurable in all of the runs, and ranged from about 4 µg to 6 µg.

Quality Control:

Chromium was detected in the blank, which is not unusual. In this case the results should be blank corrected, since the sample levels are so low that the blank level is significant compared to them. The spike recovery (99%) was within the normal range of 75% to 125%. The deviation of the prepared duplicate pair was 1.2% which is well within the normal limit of 20%. All of the digestates were analyzed in duplicate.

First Analytical Laboratories
1126 Burning Tree Dr. Chapel Hill, NC 27517
Tel. (919) 942-8607
FAX (919) 929-8688
www.firstanalyticallabs.com

ANALYSIS REPORT

Project #: 71001
Client: Air Compliance Testing, Inc.
Client Project: 070920

Report Date: 04-Oct-07
Date Received: 02-Oct-07

Total Micrograms in Sample

Sample	Cr µg
070920A-BL	1.5
070920A-1	4.5
070920A-2	5.5
070920A-3	3.9
070920B-1	6.0
070920B-2	4.6
070920B-3	5.4

QC SUMMARY

Spike, %Recovery	99%
Duplicate, RPD	1.2%

CHROMIUM

GFAA ANALYSIS RUN SUMMARY AND CALCULATION WORKSHEET

Client: Air Compiance Testing, Inc.
Proj. #: 71001
Date: 04-Oct-07

MDL = 5 µg/L
Predig'n spike conc. = 100 µg/L

Sample ID Client	FAL	Test Sol'n µg/L	Dig'te Conc µg/L	FV ml	Dil'n Factor	Total Volume ml	Volume Dig'd ml	Total µg
070920A-BL	71001.B	5.9	5.9	50	1	500	100	1.5
070920A-1	71001.A1	18.7	18.7	50	1	477	100	4.5
070920A-2	71001.A2	23.3	23.3	50	1	475	100	5.5
070920A-3	71001.A3	16.5	16.5	50	1	474	100	3.9
070920B-1	71001.B1	25.0	25.0	50	1	477	100	6.0
070920B-2	71001.B2	19.4	19.4	50	1	476	100	4.6
070920B-3	71001.B3	22.7	22.7	50	1	474	100	5.4

Bench Spike(50)	71001.B1S	71.7	% REC =	93.4%
Spike	71001.A1S	117.4	% REC =	98.7%
Duplicate	71001.B1D	25.3	% RPD =	1.2%

Calibration Data

	True conc. µg/L	Abs.	Corr. Coeff.
Blank	0.0	0.000	0.9996
Standard 1	10	0.138	
Standard 2	20	0.285	Inst: B
Standard 3	50	0.684	
Standard 4	100	1.328	

Calibration Verifications

ICV = 50	53.4	CCV2 = 50	51.4
ICB = 0	0.9	CCB2 = 0	1.6
CCV1 = 50	53.7		
CCB1 = 0	1.8		

First Analytical Laboratories
1126 Burning Tree Dr.
Chapel Hill, NC 27514
Tel. (919) 942-8607
FAX (919) 929-8688

-71001

Air Compliance Testing Project # 070920
Date Shipped: 10/1/2007
Shipper: UPS
Airbill #:

P.O. # 227 ~~070920A~~

Page: 1 of 2

Chain of Custody Record

Sample #	Run #	Contnr. #	Matrix	Comments
				Analyze all samples for total Cr
				as per Section 11.0 of
				U.S. EPA Method 306
070920A - 1 - M306/SR	1	1	225.4 ml .1N NaOH / 13.1ml H2O	Split from 450.8 ml .1N NaOH / 26.2 ml H2O
070920A - 2 - M306/SR	2	1	225.3 ml .1N NaOH / 12.2 ml H2O	Split from 450.6 ml .1N NaOH / 24.4 ml H2O
070920A - 3 - M306/SR	3	1	225.4 ml .1N NaOH / 11.7 ml H2O	Split from 450.7 ml .1N NaOH / 23.3 ml H2O
050933 - BL - M306/SR	BL	2	250 ml .1N NaOH	Split from 500ml .1N NaOH
				Notes: If questions contact:
Received By:	Relinquished By:		Date:	Tate Strickler 216.525.0900 x 235
	Tate Str. [illegible]		9/28/07	or - Rob Lisy 216.525.0900 x 232
M. Barry FAL			10/2/07	

Air Compliance Testing, Inc.
(Method 306.xls-First Analytical Laboratories) 9/28/2007

Job Number: 070920
Date: 9/28/07
Checked By: TS

First Analytical Laboratories
1126 Burning Tree Dr.
Chapel Hill, NC 27514
Tel. (919) 942-8607
FAX (919) 929-8688

-71001

Air Compliance Testing Project # 070920	
Date Shipped: 10/1/2007	
Shipper: UPS	
Airbill #:	

P.O. # 227

Page: 2 of 2

Chain of Custody Record

Sample #	Run #	Contnr. #	Matrix	Comments
				Analyze all samples for total Cr
				as per Section 11.0 of
				U.S. EPA Method 306
070920B - 1 - M306/SR	1	1	225.2 ml .1N NaOH / 13.4ml H2O	Split from 450.3 ml .1N NaOH / 26.7 ml H2O
070920B - 2 - M306/SR	2	1	225.1 ml .1N NaOH / 12.9 ml H2O	Split from 450.2 ml .1N NaOH / 25.8 ml H2O
070920B - 3 - M306/SR	3	1	225.2 ml .1N NaOH / 11.8 ml H2O	Split from 450.4 ml .1N NaOH / 23.6 ml H2O

Received By:	Relinquished By:	Date:	Notes: If questions contact:
	Tate Strickler	9/28/07	Tate Strickler 216.525.0900 x 235
M. Barry FAL		10/2/07	or - Rob Lisy 216.525.0900 x 232

Job Number: 070920
Date: 9/28/07
Checked By: TS

Method 306 Record of Custody Sheet

ansportation Container Number 6

gent Tray Number 3

-71001

Seal I.D. no.		Full Signature	Date	Time	Reason for Breaking Seal	Final Vol. mL
070920 A - 1 - M306/SR	S	[illegible]	9-27-07	12:33		~~476.2~~
	B	[illegible]	9/28/07	0910	234/477	
	S	[illegible]	9/28/07	0950	Sample Split	
	B					
070920 A - 2 - M306/SR	S	[illegible]	9-27-07	14 34		474.4
	B	[illegible]	9/28/07	0915	238/475	
	S	[illegible]	9/28/07	0950	Sample Split	
	B					
070920 A - 3 - M306/SR	S	[illegible]	9-27-07	16:37	237/474	473.3
	B	[illegible]	9/28/07	0926		
	S	[illegible]	9/28/07	0950	Sample Split	
	B					
070920 A - ~~BL - M306/SR~~ M306/BL	S	[illegible]	9-27-07	12:36	280/500	500
	B	[illegible]	9/28/07	0929		
	S	[illegible]	9/28/07	0950	Sample Split	
	B					
	S					
	B					
	S					
	B					
	S					
	B					
	S					
	B					
	S					
	B					
	S					
	B					

Were all seals intact?____Yes _____No (Describe seal and reasoning in the "Remarks")

Were all liquid levels at marked levels?______Yes _______No (Estimate loss in the "Remarks")

Received By Sample Custodian ____________________ ____________ ____________

(Full Signature) (Date) (Time)

Remarks: ______________________________

Job Number: 070920 A

Done By / Date: AS 9-27-07

Final Check By / Date: [illegible] 9/28/07

Method 306 Record of Custody Sheet

Transportation Container Number 6 **-71001**

gent Tray Number 3

Seal I.D. no.		Full Signature	Date	Time	Reason for Breaking Seal	Final Vol. mL
070920 B - 1 - M306/SR	S	[illegible]	9-27-07	11:48	238/477	~~476.1~~
	B	[illegible]	9/28/07	0933		
	S	[illegible]	9/28/07	0952	Sample split	
	B					
070920 B - 2 - M306/SR	S	[illegible]	9-27-07	14:57	238/476	475.8
	B	[illegible]	9/28/07	0940		
	S	[illegible]	9/28/07	0952	Sample split	
	B					
070920 B - 3 - M306/SR	S	[illegible]	9-27-07	17:02	237/474	473.6
	B	[illegible]	9/28/07	0944		
	S	[illegible]	9/28/07	0952	Sample split	
	B					
070920 B - BL - M306/SR	S					
	B					
	S					
	B					
	S					
	B					
	S					
	B					
	S					
	B					
	S					
	B					
	S					
	B					
	S					
	B					

Were all seals intact?____Yes _____No (Describe seal and reasoning in the "Remarks")

Were all liquid levels at marked levels?______Yes _______No (Estimate loss in the "Remarks")

Received By Sample Custodian ____________________ ____________ ____________

(Full Signature) (Date) (Time)

Remarks: ____________________

Job Number: 070920 B

Done By / Date: RB / 9-27-07

Final Check By / Date: [illegible] / 9/28/07

FROM: **10 LBS** **1 OF 1**
TATE STRICKLER
(216) 525-0900 257
AIR COMPLIANCE TESTING INC
PO BOX 41156
`LEVELAND OH 44141

-71001

SHIP TO:

WILLIAM WADLIN
(919) 942-8607
FIRST ANALITICAL LABORATORIES
1126 BURNING TREE DR.
CHAPEL HILL NC 27517-4004

REF 1:070920

NC 275 4-01

UPS NEXT DAY AIR **1**
TRACKING #: 1Z FR8 740 01 4157 8157

BILLING: P/P
HAZARDOUS MATERIALS - AIR ELIGIBLE
HAZ#: NaOH

WS 9.0.49 Canon iP1700 89.0A 07/2007

Fold here and place in label pouch

Instr. B

GFAA Raw Data

Corr. Coeff. 0.99964

Sample_ID	EL	Sam_Date	Sam_Time	Mean_Sig	Mean_ST	Cal_Units	Dilu	Rec	Std_U 1	Std_U 2	RSD
Calib Blank	Cr	04-Oct-07	8:59:33	0.0000		µg/L					18192.00
10 ppb Cr	Cr	04-Oct-07	9:07:35	0.1378		µg/L					0.83
20 ppb Cr	Cr	04-Oct-07	9:15:41	0.2849		µg/L					0.76
50 ppb Cr	Cr	04-Oct-07	9:23:45	0.6843		µg/L					0.80
100 ppb Cr	Cr	04-Oct-07	9:31:52	1.3284		µg/L					0.02
ICV	Cr	04-Oct-07	9:40:50	0.7160	53.441	µg/L			52.841	54.041	1.59
ICB	Cr	04-Oct-07	9:48:41	0.0124	0.922	µg/L			1.677	0.167	115.80
71001.LB	Cr	04-Oct-07	9:56:34	0.0016	0.121	µg/L			0.209	0.033	103.30
71001.LCS	Cr	04-Oct-07	10:04:29	0.7306	54.533	µg/L			53.551	55.516	2.55
71001.B	Cr	04-Oct-07	10:12:20	0.0792	5.908	µg/L			6.672	5.144	18.29
71001.A1	Cr	04-Oct-07	10:16:14			µg/L	20		1.275		
71001.A1	Cr	04-Oct-07	10:26:13	0.2506	18.706	µg/L			18.813	18.600	0.80
71001.A1S	Cr	04-Oct-07	10:34:06	0.7862	58.677	µg/L	2		58.660	58.694	0.04
71001.A2	Cr	04-Oct-07	10:42:01	0.3122	23.300	µg/L			23.397	23.202	0.59
71001.A3	Cr	04-Oct-07	10:49:58	0.2211	16.500	µg/L			17.174	15.825	5.78
71001.B1	Cr	04-Oct-07	10:57:58	0.3349	24.995	µg/L			24.900	25.091	0.54
71001.B1	Cr	04-Oct-07	11:06:10	0.9609	71.717	µg/L		93.44	71.025	72.409	1.36
CCV	Cr	04-Oct-07	11:14:10	0.7197	53.717	µg/L			53.970	53.463	0.67
CCB	Cr	04-Oct-07	11:22:02	0.0244	1.822	µg/L			2.176	1.469	27.43
71001.B1D	Cr	04-Oct-07	11:29:58	0.3388	25.287	µg/L			25.196	25.378	0.51
71001.B2	Cr	04-Oct-07	11:38:03	0.2602	19.423	µg/L			19.612	19.233	1.38
71001.B3	Cr	04-Oct-07	11:46:10	0.3044	22.716	µg/L			22.554	22.879	1.01
CCV	Cr	04-Oct-07	11:54:14	0.6883	51.376	µg/L			51.392	51.360	0.04
CCB	Cr	04-Oct-07	12:02:05	0.0213	1.593	µg/L			2.339	0.847	66.20

TEST DATA

	Run 1	Run 2	Run 3	Average
Number of Test Runs	3			
Traverse Points	24			
Stack Cross-Sectional Diameter 1 (circular) (in)	47.80	47.80	47.80	47.80
Stack Cross-Sectional Diameter 2 (circular) (in)	47.80	47.80	47.80	47.80
Pitot Tube Coefficient (Cp)	0.84	0.84	0.84	0.84
Barometric Pressure at Ground Level (Pbar) (in Hg)	29.17	29.17	29.17	29.17
Elevation Difference Between Ground Level and Meter Box Locations (ft)	57.00	57.00	57.00	57.00
Elevation Difference Between Ground Level and Sampling Locations (ft)	57.00	57.00	57.00	57.00
Initial Dry Gas Meter Reading (ft3)	418.805	500.510	583.773	
Final Dry Gas Meter Reading (ft3)	500.400	583.665	664.635	
Dry Gas Meter Calibration Factor (Gamma)	1.0154	1.0154	1.0154	1.0154
Dry Gas Meter Calibration Coefficient (Delta H@)	1.822	1.822	1.822	1.822
Total Sampling Run Time (Theta) (min)	120	120	120	120
Volume of Water Vapor Condensed in the Impingers (g)	26.2	24.4	23.3	24.6
Weight of Water Vapor Collected in Silica Gel (g)	15.7	15.5	14.5	15.2

Average Pitot Rotation Angle	
Port Number 1	15.3
Port Number 2	15.6

	Run 1	Run 2	Run 3
Test Run Start Time (hrmin)	8:26	10:52	13:38
Test Run Stop Time (hrmin)	10:36	13:03	16:01

DETAILED RESULTS

Stack Gas Conditions

	Run 1	Run 2	Run 3	Average
Stack Cross-Sectional Area (A) (ft2)	12.462	12.462	12.462	12.462
Barometric Pressure at Sampling Location (in Hg)	29.12	29.12	29.12	29.12
Dry Molecular Weight of Stack Gas (Md) (lb/lb-mole)	29.00	29.00	29.00	29.00
Wet Molecular Weight of Stack Gas (Ms) (lb/lb-mole)	28.73	28.75	28.76	28.75
Average Absolute Stack Gas Pressure (Ps) (in Hg)	29.09	29.07	29.08	29.08
Average Stack Gas Static Pressure (ps) (in H2O)	-0.40	-0.55	-0.51	-0.48
Average Stack Gas Temperature (ts) (°F)	75.4	76.1	76.0	75.8
Average Stack Gas Temperature (Ts) (°R)	535.4	536.1	536.0	535.8
Average Stack Gas Velocity (Vs) (ft/sec)	47.46	47.75	47.78	47.66
Average Stack Gas Velocity (Vs) (ft/min)	2,848	2,865	2,867	2,860
Wet Volumetric Stack Gas Flow at Actual Conditions (Qaw) (acfm)	35,487	35,703	35,722	35,637
Wet Volumetric Stack Gas Flow at Standard Conditions (scfm)	34,019	34,169	34,201	34,130
Dry Volumetric Stack Gas Flow at Standard Conditions (Qstd) (dscfm)	33,199	33,398	33,446	33,347
Percent by Volume Moisture as measured in Stack Gas (%H2O)	2.41	2.26	2.21	2.29

Test Results

	Run 1	Run 2	Run 3	Average
Volume of Dry Gas Sampled at Standard Conditions (Vmstd) (dscf)	79.946	81.456	78.932	80.111
Rate of Dry Gas Sampled at Standard Conditions (dscfm)	0.666	0.679	0.658	0.668
Predicted 1-Hour Sample Volume Based on Current Sampling Rate (dscf)	39.973	40.728	39.466	40.056
Dry Mole Fraction of Flue Gas (Mfd) (1-bw/100)	0.976	0.977	0.978	0.977
Average Velocity Pressure (Delta P) (in H2O)	0.6900	0.6967	0.6983	0.6950
Average Square Root of Delta P	0.8257	0.8303	0.8310	0.8290
Average Pressure Differential of Orifice Meter (Delta H) (in H2O)	1.5575	1.6525	1.5858	1.5986
Average DGM Temperature (tm) (°F)	74.563	74.813	76.604	75.326
Average Dry Gas Meter Temperature (Tm) (°R)	534.563	534.813	536.604	535.326
Volume of Metered Gas Sample (Vm) (dry) (acf)	81.595	83.155	80.862	81.871
Post-Test Calibration (Yqa)	1.0376	1.0488	1.0584	1.0483
Post-Test/Pre-Test Calibration Factor Difference (%)	-2.18	-3.29	-4.24	-3.24

SAMPLING QA

	Run 1	Run 2	Run 3	Average
Current Predicted Allowable Post-Test Leak Rate (dscfm)	0.020	0.020	0.020	0.020
Current Sampling Rate Status	**OK**	**OK**	**OK**	
Probe Nozzle Diameter (in)	0.217	0.221	0.217	0.218
Percent Isokinetic of Sampling Rate (% I)	97.4	95.1	95.4	96.0
In Field Isokinetic QA	GOOD	GOOD	GOOD	
Count of Velocity Pressure Readings Below 0.05 in H2O	0	0	0	0
Sensitivity Factor for Differential Pressure Gauge (T)	1.004	1.004	1.004	1.004
Is Meter Box Manometer Adequate (Yes / No) ?	YES	YES	YES	

MEASURED DATA FROM TEST RUNS

Point Count	Run #	Run Time (min)	Pitot Delta P (in H2O)	Square Root of Delta P	Orifice Delta H (in H2O)	DGM Temp IN (°F)	DGM Temp OUT (°F)	Average DGM Temp (°F)	Stack Pressure (in H2O)	Stack Temp (°F)
1	1	0	0.80	0.894	1.80	69	68	68.50	-0.80	75
2	1	5	0.90	0.949	2.00	79	69	74.00	-0.25	74
3	1	10	0.93	0.964	2.10	80	70	75.00	-0.50	74
4	1	15	0.93	0.964	2.10	81	71	76.00	-0.38	75
5	1	20	0.89	0.943	2.00	83	71	77.00	-0.34	77
6	1	25	0.74	0.860	1.70	83	72	77.50	-0.32	78
7	1	30	0.45	0.671	1.00	82	72	77.00	-0.32	78
8	1	35	0.52	0.721	1.10	82	72	77.00	-0.29	75
9	1	40	0.54	0.735	1.20	81	73	77.00		74
10	1	45	0.53	0.728	1.20	80	73	76.50		75
11	1	50	0.50	0.707	1.10	79	72	75.50		77
12	1	55	0.48	0.693	1.10	78	72	75.00		76
13	1	60	0.69	0.831	1.50	70	70	70.00		73
14	1	65	0.72	0.849	1.60	76	70	73.00		75
15	1	70	0.71	0.843	1.60	76	70	73.00		77
16	1	75	0.71	0.843	1.60	77	70	73.50		77
17	1	80	0.70	0.837	1.60	77	70	73.50		77
18	1	85	0.63	0.794	1.45	77	70	73.50		73
19	1	90	0.48	0.693	1.10	78	70	74.00		72
20	1	95	0.61	0.781	1.40	77	70	73.50		74
21	1	100	0.76	0.872	1.75	78	70	74.00		76
22	1	105	0.83	0.911	1.91	79	70	74.50		77
23	1	110	0.83	0.911	1.91	80	70	75.00		77
24	1	115	0.68	0.825	1.56	81	71	76.00		74
25	2	0	0.85	0.922	2.10	76	70	73.00	-0.81	78
26	2	5	0.90	0.949	2.25	80	71	75.50	-0.82	78
27	2	10	0.92	0.959	2.30	81	71	76.00	-0.82	74
28	2	15	0.92	0.959	2.30	81	71	76.00	-0.79	74
29	2	20	0.86	0.927	2.15	81	72	76.50	-0.80	76
30	2	25	0.69	0.831	1.73	80	72	76.00	-0.59	77
31	2	30	0.45	0.671	1.13	79	72	75.50	-0.58	78
32	2	35	0.54	0.735	1.35	78	71	74.50	-0.54	78
33	2	40	0.58	0.762	1.33	78	71	74.50	-0.30	74
34	2	45	0.58	0.762	1.33	78	71	74.50	-0.35	74
35	2	50	0.53	0.728	1.22	78	71	74.50	-0.35	77
36	2	55	0.48	0.693	1.10	78	71	74.50	-0.28	77
37	2	60	0.68	0.825	1.56	71	70	70.50	-0.44	77
38	2	65	0.68	0.825	1.56	79	70	74.50	-0.52	74
39	2	70	0.69	0.831	1.59	80	70	75.00	-0.54	76
40	2	75	0.69	0.831	1.59	79	70	74.50	-0.54	77
41	2	80	0.69	0.831	1.59	79	71	75.00	-0.54	77
42	2	85	0.64	0.800	1.47	79	71	75.00	-0.52	77
43	2	90	0.50	0.707	1.15	79	71	75.00	-0.54	72
44	2	95	0.65	0.806	1.50	78	71	74.50	-0.54	74
45	2	100	0.77	0.877	1.77	79	71	75.00	-0.54	77
46	2	105	0.83	0.911	1.91	80	71	75.50	-0.54	77
47	2	110	0.86	0.927	1.98	79	71	75.00	-0.54	77
48	2	115	0.74	0.860	1.70	79	71	75.00	-0.28	77

MEASURED DATA FROM TEST RUNS

Point Count	Run #	Run Time (min)	Pitot Delta P (in H2O)	Square Root of Delta P	Orifice Delta H (in H2O)	DGM Temp IN (°F)	DGM Temp OUT (°F)	Average DGM Temp (°F)	Stack Pressure (in H2O)	Stack Temp (°F)
49	3	0	0.87	0.933	1.96	69	69	69.00	-0.82	73
50	3	5	0.89	0.943	2.00	79	69	74.00	-0.82	77
51	3	10	0.89	0.943	2.00	80	70	75.00	-0.80	77
52	3	15	0.92	0.959	2.07	81	70	75.50	-0.78	78
53	3	20	0.89	0.943	2.00	82	71	76.50	-0.74	78
54	3	25	0.75	0.866	1.69	82	71	76.50	-0.58	72
55	3	30	0.46	0.678	1.04	81	71	76.00	-0.30	73
56	3	35	0.53	0.728	1.19	80	71	75.50	-0.28	77
57	3	40	0.53	0.728	1.19	80	71	75.50	-0.26	77
58	3	45	0.53	0.728	1.19	81	71	76.00	-0.24	78
59	3	50	0.53	0.728	1.19	82	71	76.50	-0.22	77
60	3	55	0.50	0.707	1.13	82	71	76.50	-0.22	72
61	3	60	0.68	0.825	1.53	77	70	73.50	-0.48	77
62	3	65	0.71	0.843	1.60	84	71	77.50	-0.52	73
63	3	70	0.71	0.843	1.60	85	72	78.50	-0.52	75
64	3	75	0.71	0.843	1.60	85	72	78.50	-0.54	77
65	3	80	0.69	0.831	1.59	84	73	78.50	-0.56	77
66	3	85	0.62	0.787	1.43	84	73	78.50	-0.58	77
67	3	90	0.49	0.700	1.13	83	73	78.00	-0.56	77
68	3	95	0.65	0.806	1.55	83	73	78.00	-0.52	73
69	3	100	0.78	0.883	1.79	84	73	78.50	-0.52	77
70	3	105	0.84	0.917	1.93	84	73	78.50	-0.52	77
71	3	110	0.86	0.927	1.98	85	73	79.00	-0.50	77
72	3	115	0.73	0.854	1.68	85	73	79.00	-0.30	77

TEST DATA

CONCENTRATION CALCULATIONS

Calculate the Total ug's of Cr in Each Sample

	Run 1	Run 2	Run 3	Average
Vml (Volume of impinger plus rinses) (ml)	**477**	**475**	**474**	475
C (Concentration of Cr in sample) (ug Cr/ml)	**0.01870**	**0.02330**	**0.01650**	0.01950
F (Dilution Factor=Vol.of aliquot after dilution/Vol. of aliquot before dilution) (ml/ml)	**1.0**	**1.0**	**1.0**	1.0
D (Digestion Factor=Vol. of sample aliquot after digestion / Vol. of sample aliquot submitted to digestion)(ml/ml) (Digestion Factor is typically 0.5)	**0.500**	**0.500**	**0.500**	0.500
Total Cr in each field sample (ug)	4.5	5.5	3.9	4.6

Chromium Emission Results

	Run 1	Run 2	Run 3	Average
Vmstd (Dry Standard Volume Metered on DGM) (dscm)	2.264	2.307	2.235	2.269
Measured Chromium Concentration (mg/dscm)	0.00197	0.00240	0.00175	0.00204
Chromium Concentration (lb/dscf)	1.230E-10	1.498E-10	1.092E-10	1.273E-10
Chromium Emission Rate (lb/hr)	0.00024	0.00030	0.00022	0.00025
Chromium Concentration (ppmv)	0.00091	0.00111	0.00081	0.00094
Chromium Emission Rate (mg/hr)	111.12	136.13	99.42	115.56

EPA Methods 1, 2, 4, and 306 Nomenclature and Sample Calculations
Run No. - 1

Constants

CO_2F_{wt}= 44.0	in wg= 0.073529	NO_2F_{wt}= 46.01	$HClF_{wt}$= 36.46
O_2F_{wt}= 32.0	gr= 0.000142857	COF_{wt}= 28.01	SO_2F_{wt}= 64.06
CON_2F_{wt}= 28.0	mmBtu= 1000000 Btu	$H_2SO_4F_{wt}$= 98.08	Cl_2F_{wt}= 70.91
H_2OF_{wt}= 18.0	CF_{wt}= 12.011	T_{std}= 528	P_{std}= 29.92

Stack Variables

Cp =	0.84	pitot tube coefficient (dimensionless)
P_{bar} =	29.17 in. Hg	barometric pressure
E_{box} =	57 ft	elevation difference between ground level and meter box
E_{sam} =	57 ft	elevation difference between ground level and sampling ports
γ =	1.0154	gamma, dry gas meter calibration factor (dimensionless)
θ =	120.0 min	net run time (minutes)
V_{lc} =	41.9 g	total mass of liquid collected in impingers (g)
A =	12.4619 ft^2	stack cross-sectional area
P_g =	-0.40 in. H_2O	flue gas static pressure
T_{savg} =	535.42 R	average absolute flue gas temperature (460R+tsavg °F)
$SQ\Delta P_{avg}$ =	0.83 in. wg	average square root ΔP
ΔH =	1.56 in. wg	average pressure differential of orifice meter
T_m =	534.56 R	dry gas meter temperature (460R+tsavg °F)
V_m =	81.60 ft^3	volume of metered gas sample (dry actual cubic feet)
D_n =	0.217 in.	sampling nozzle diameter

Calculated Stack Variables

Barometric pressure at sampling location

NOTE: Barometric pressure recorded at ground level

$P_{sam} = P_{bar} - [(E_{sam} / 100 \text{ ft}) * 0.1 \text{ in. Hg}]$

$P_{sam} = 29.17 - ((57.0 / 100) * 0.1)$

$P_{sam} =$ 29.12 in. Hg

Volume of dry gas sampled at standard conditions (dscf)

$V_{mstd} = \gamma * Vm * [P_{bar} - ([(E_{box} / 100 \text{ ft}) * 0.1 \text{ in. Hg}] + (\Delta H / 13.6)) / P_{std}] * (T_{std} / T_m)$

$V_{mstd} = 1.0154 * 81.595 * ((29.17 - ((57.0 / 100) * 0.1) + (1.5575 / 13.6)) / 29.92) * (528.0 / 534.563)$

$V_{mstd} =$ 79.946 ft^3

Volume of water vapor at standard conditions (68 °F, scf)

$V_{wstd} = (0.04715 \text{ ft}^3/\text{g}) * Vlc$

$V_{wstd} = (0.04715 * 41.9)$

$V_{wstd} =$ 2.0 ft^3

Percent moisture by volume as measured in flue gas

$\%H_2O$ (Measured) = $100 * [V_{wstd} / (V_{wstd} + V_{mstd})]$

$\%H_2O$ (Measured) = $100 * (1.976 / (1.976 + 79.946))$

$\%H_2O$ (Measured) = 2.41

Absolute flue gas pressure

$P_s = P_{sam} + (Pg / 13.6)$

$P_s = 29.12 + (-0.40 / 13.6)$

$P_s =$ 29.09 in. Hg

Dry mole fraction of flue gas (dimensionless)

$M_{fd} = 1 - (\%H_2O / 100)$

$M_{fd} = 1 - (2.41 / 100)$

$M_{fd} =$ 0.976

Dry molecular weight of flue gas (lb/lb-mole)

$M_d = [(\%CO_2 / 100) * 44.0] + [(\%O_2 / 100) * 32.0] + [((100 - \%CO_2 - \%O_2) / 100) * 28.0]$

$M_d = ((0.00 / 100) * 44.0) + ((0.00 / 100) * 32.0) + (((100 - 0.00 - 0.00) / 100) * 28.0)$

$M_d =$ 28.00 lb/lb-mole

$M_d =$ 29.00

Wet molecular weight of flue gas (lb/lb-mole)

$M_s = M_d * M_{fd} + (H_2OF_{wt} * (\%H_2O / 100))$

$M_s = 29.000 * 0.976 + 18.00 * (2.41 / 100)$

$M_s =$ 28.73 lb/lb-mole

Average flue gas velocity (ft/sec)

$v_s = 85.49 * Cp * (SQ\Delta P_{avg}) * (T_{avg} / (P_s * M_s))^{0.5}$

$v_s = 85.49 * 0.84 * (0.8257) * (535.42 / (29.086 * 28.735))$ ^ 0.5

$v_s =$ 47.46 ft/sec

Wet volumetric flue gas flow rate at actual conditions (acfm)

$Q_{aw} = v_s * A * 60$ sec/min

$Q_{aw} = 47.460 * 12.462 * 60$

$Q_{aw} =$ 35,487 ft^3/min

Wet volumetric flue gas flow rate at standard conditions (scfm)

$Q_{sdw} = v_s * A * (T_{std} / T_{savg}) * (P_s / P_{std}) * 60$ sec/min

$Q_{sdw} = 47.460 * 12.462 * (528.0 / 535.417) * (29.086 / 29.92) * 60$

$Q_{sdw} =$ 34,019 ft^3/min

Dry volumetric flue gas flow rate at standard conditions (dscfm)

$Q_{sd} = M_{fd} * v_s * A * (T_{std} / T_{savg}) * (P_s / P_{std}) * 60$ sec/min

$Q_{sd} = 0.976 * 47.4604 * 12.4619 * (528.0 / 535.417) * (29.086 / 29.92) * 60$

$Q_{sd} =$ 33,199 ft^3/min

Isokinetic Calculations

Percent isokinetic of sampling rate (%)

$\%I = (P_{std} / T_{std}) * (T_{savg} / P_s) * [V_{mstd} / (v_s * M_{fd} * \theta * \pi * (D_n / 2)^2)]$

%I = (((29.92 / 528.0) * (535.417 / 29.086)) * (79.946 / (47.4604 * 0.976 * 120.0 * (()3.141593 * (0.217 / 2) ^ 2) / 144))) / 60) * 100

%I = 97.4 %

Method 306 Calculations

Total Cr catch weight (ug)

$ug_{quan} =$ 4.46 ug

Total Cr concentration (mg/dscm)

$C_{grcm} = ug_{quan} /(1000 * V_{mstdm})$

$C_{grcm} = 4.46 / 2.264$

$C_{grcm} =$ 0.001970 mg/dscm

Method 306 Is[illegible]etic Field Data

Plant	Bf Goodrich Plating	Meter box no.	T-MTB- 011	Gamma	1.0154
Location	P001 Exhaust Stack (A)	Pump no.	T-PMP- 011	K Factor	2.25 / 2.20 / 2.3
Run no.	1	Nomograph no.	T-NOM- CALC	Nozzle Size, in.	.217
Test start time	8:26	Probe no.	T-PRB- 608	Barometric pressure, in.Hg	29.17
Test stop time	10:36	Filter box no.	T-FLB- 011	Ambient temperature, °F	67
Pre-test leak rate @ 15in.Hg	.001	Impinger box no.	T-IMB- 002	Filter box temperature setting, °F	N/A
Post-test leak rate @ 5 in.Hg	.001	Umbilical cord no.	T-UMC- 602	Probe temperature setting, °F	N/A
Pre-test pitot leak check -	total ✓ static ✓	Umbilical adapter no.	T-UMA- 008	Orsat flow rate setting, SCFH	N/A
Post-test pitot leak check -	total ✓ static ✓	Orsat bag no.	N/A	Meter box operator	CG Date 9/27/07

L	POINT	CLOCK TIME min	DRY GAS METER CF	PITOT In. H_2O ΔP	ORIFICE ΔH In. H_2O DESIRED	ORIFICE ΔH In. H_2O ACTUAL	PROBE TEMP °F	STACK TEMP °F	DRY GAS TEMP, °F INLET	DRY GAS TEMP, °F OUTLET	OVEN TEMP °F	IMPINGER TEMP °F	PUMP VACUUM in.Hg	ORSAT FLOW SCFH	STATIC PRESSURE ± In.H_2O
2.25	1	0	418.750	.80	1.80	1.80	67	75	69	68	66	66	-4	—	—
	2	5	422.435	.90	2.03	2.00	67	74	79	69	67	45	-5	—	-.80
	3	10	426.120	.93	2.09	2.10	68	74	80	70	67	49	-5	—	—
	4	15	430.010	.93	2.09	2.10	68	75	81	71	67	51	-5	—	—
	5	20	434.250	.89	2.00	2.00	68	77	83	71	68	49	-5	—	—
	6	25	437.945	.74	1.66	1.70	68	78	83	72	67	50	-4	—	—
	7	30	441.465	.45	1.01	1.00	69	78	82	72	68	50	-3	—	-.25
2.20	8	35	444.300	.52	1.14	1.10	69	75	82	72	68	50	-3	—	—
	9	40	447.175	.54	1.19	1.20	69	74	81	73	67	50	-3	—	—
	10	45	450.050	.53	1.17	1.20	68	75	80	73	67	50	-3	—	—
	11	50	453.010	.50	1.10	1.10	67	77	79	72	67	51	-3	—	—
	12	55	455.890	.48	1.06	1.10	67	76	78	72	66	51	-3	—	—
	1	60	458.755	.69	1.52	1.50	66	73	70	70	66	52	-4	—	—
	2	65	462.540	.72	1.58	1.60	66	75	76	70	66	47	-4	—	—
	3	70	465.960	.71	1.56	1.60	66	77	76	70	66	49	-4	—	—
	4	75	469.390	.71	1.56	1.60	66	77	77	70	66	50	-4	—	—
2.3	5	80	472.810	.70	1.61	1.60	66	77	77	70	66	51	-4	—	-.50
	6	85	476.230	.63	1.45	1.45	66	73	77	70	66	51	-4	—	—
	7	90	479.510	.48	1.10	1.10	66	72	78	70	66	51	-3	—	—
	8	95	482.61	.61	1.40	1.40	66	74	77	70	66	51	4.0	—	-.38
	9	100	485.62	.76	1.75	1.75	67	76	78	70	67	52	4.5	—	-.34
	10	105	489.19	.83	1.91	1.91	67	77	79	70	67	52	5.0	—	-.32
	11	110	492.97	.83	1.91	1.91	67	77	80	70	67	53	5.0	—	-.32
	12	115	496.81	.68	1.56	1.56	68	74	81	71	68	54	-5	—	-.29
	Final	120	500.400												

Nomograph Calibration Variables ΔH@ 1.822 Cp 0.84 Ts Tm Ps Pm ΔP Bws

Comments: PAUSE FOR PC @ 9:26 - 9:35 LEAK ✓ 458.755 - 458.810
-0.055

Test Observers -

Job Number: 070920 A

Air Compliance Testing, Inc.
(Metho[illegible] Is-Isokinetic Field Data) 9/13/2007

Done By / Date: CG 9/27/07
Final Check By / Date: PL 9/28/07

Method 306 Isokinetic Field Data

Plant	Bf Goodrich Plating	Meter box no.	T-MTB- 011	Gamma	1.0154
Location	P001 Exhaust Stack (A)	Pump no.	T-PMP- 011	K Factor	2.5 / 2.31
Run no.	2	Nomograph no.	T-NOM- —	Nozzle Size, in.	.221
Test start time	10:52	Probe no.	T-PRB- 610	Barometric pressure, in.Hg	29.17
Test stop time	13:03	Filter box no.	T-FLB- 008	Ambient temperature, °F	69
Pre-test leak rate @ 15in.Hg	0.001	Impinger box no.	T-IMB- 003	Filter box temperature setting, °F	—
Post-test leak rate @ 5 in.Hg	0.000	Umbilical cord no.	T-UMC- 602	Probe temperature setting, °F	—
Pre-test pitot leak check -	total ✓ static ✓	Umbilical adapter no.	T-UMA- 017	Orsat flow rate setting, SCFH	—
Post-test pitot leak check -	total ✓ static ✓	Orsat bag no.	—	Meter box operator	CG Date 9/27/07

K	POINT	CLOCK TIME min	DRY GAS METER CF	PITOT In. H_2O ΔP	ORIFICE ΔH In. H_2O DESIRED	ORIFICE ΔH In. H_2O ACTUAL	PROBE TEMP °F	STACK TEMP °F	DRY GAS TEMP, °F INLET	DRY GAS TEMP, °F OUTLET	OVEN TEMP °F	IMPINGER TEMP °F	PUMP VACUUM In.Hg	ORSAT FLOW SCFH	STATIC PRESSURE ± In.H_2O
2.5	1	0	500.490	.85	2.1	2.1	70	78	76	70	68	59	3.5	—	-.81
	2	5	504.365	.90	2.25	2.25	70	78	80	71	68	53	4.0	—	-.82
	3	10	508.490	.92	2.3	2.3	70	74	81	71	68	52	4.0	—	-.82
	4	15	512.710	.92	2.3	2.3	70	74	81	71	68	54	4.0	—	.79
	5	20	516.940	.86	2.15	2.15	70	76	81	72	68	54	3.5	—	-.80
	6	25	520.950	.69	1.73	1.73	70	77	80	72	68	54	3.0	—	-.57
	7	30	524.565	.45	1.13	1.13	70	78	79	72	68	54	2.5	—	-.58
	8	35	527.540	.54	1.35	1.35	69	78	78	71	68	54	2.5	—	-.54
2.3	9	40	530.630	.58	1.33	1.33	69	74	78	71	68	54	2.5	—	-.30
	10	45	533.700	.58	1.33	1.33	69	74	78	71	68	54	2.5	—	-.35
	11	50	536.810	.53	1.22	1.22	68	77	78	71	67	53	2.5	—	-.35
	12	55	539.800	.48	1.10	1.10	68	77	78	71	67	54	2.5	—	-.28
	1	60	542.660	.68	1.56	1.56	67	77	71	70	66	58	3.0	—	-.44
	2	65	545.945	.68	1.56	1.56	67	74	79	70	66	53	3.0	—	-.52
	3	70	549.280	.69	1.59	1.59	67	76	80	70	66	52	3.0	—	-.54
	4	75	552.685	.69	1.59	1.59	67	77	79	70	66	54	3.0	—	-.54
	5	80	556.100	.69	1.59	1.59	67	77	79	71	66	55	3.0	—	-.54
	6	85	559.475	.64	1.47	1.47	67	77	79	71	66	54	3.0	—	-.52
	7	90	562.850	.50	1.15	1.15	67	72	79	71	66	54	2.5	—	-.54
	8	95	565.760	.65	1.50	1.50	67	74	78	71	66	54	3.0	—	-.54
	9	100	569.135	.77	1.77	1.77	67	77	79	71	66	53	3.5	—	-.54
	10	105	572.510	.83	1.91	1.91	67	77	80	71	66	54	3.5	—	-.54
	11	110	576.300	.86	1.98	1.98	67	77	79	71	66	54	3.5	—	-.54
	12	115	580.085	.74	1.70	1.70	67	77	79	71	66	54	3.0	✓	-.28
	Final	120	583.665												

Nomograph Calibration Variables ΔH@ 1.822 Cp .84 Ts Tm Ps Pm ΔP Bws

Comments: PAUSE PC @ 11:52 - 12:03 LEAK ✓ 542.660 - 542.680 = 0.02

Test Observers -

Job Number: 070920 A

Done By / Date: CG / 9/27/07

Final Check By / Date: [illegible] / 10/2/07

Air Compliance Testing, Inc.

(Method 306.xls-Isokinetic Field Data) 9/13/2007

Method 306 Is[illegible]netic Field Data

Plant	Bf Goodrich Plating	Meter box no.	T-MTB- 011	Gamma	1.0154
Location	P001 Exhaust Stack (A)	Pump no.	T-PMP- 011	K Factor	2.25 / 2.3 /
Run no.	3	Nomograph no.	T-NOM- CALC	Nozzle Size, in.	.217
Test start time	13:38	Probe no.	T-PRB- 60B	Barometric pressure, in.Hg	29.17
Test stop time	16:01	Filter box no.	T-FLB- 011	Ambient temperature, °F	67
Pre-test leak rate @ 15in.Hg	.001	Impinger box no.	T-IMB- 019	Filter box temperature setting, °F	—
Post-test leak rate @ 5 in.Hg	.001	Umbilical cord no.	T-UMC- 602	Probe temperature setting, °F	—
Pre-test pitot leak check -	total ✓ static ✓	Umbilical adapter no.	T-UMA- 00B	Orsat flow rate setting, SCFH	—
Post-test pitot leak check -	total ✓ static ✓	Orsat bag no.	N/A	Meter box operator	CG Date 9/27/07

K	POINT	CLOCK TIME min	DRY GAS METER CF	PITOT In. H_2O ΔP	ORIFICE ΔH In. H_2O DESIRED	ORIFICE ΔH In. H_2O ACTUAL	PROBE TEMP °F	STACK TEMP °F	DRY GAS TEMP, °F INLET	DRY GAS TEMP, °F OUTLET	OVEN TEMP °F	IMPINGER TEMP °F	PUMP VACUUM in.Hg	ORSAT FLOW SCFH	STATIC PRESSURE ± In.H_2O	
2.25	1	0	583.755	.87	1.96	1.96	66	73	69	69	66	55	4.0	—	-.82	
	2	5	587.500	.89	2.00	2.00	67	77	79	69	66	50	4.0	—	-.82	
	3	10	591.355	.89	2.00	2.00	67	77	80	70	66	51	4.0	—	-.80	
	4	15	595.225	.92	2.07	2.07	67	78	81	70	66	53	4.5	—	-.78	
	5	20	599.090	.89	2.00	2.00	67	78	82	71	66	54	4.5	—	-.74	
	6	25	602.985	.75	1.69	1.69	67	72	82	71	66	56	4.0	—	-.58	
	7	30	606.550	.46	1.04	1.04	66	73	81	71	65	52	3.0	—	-.30	
	8	35	609.350	.53	1.19	1.19	66	77	80	71	65	51	3.0	—	-.28	Avg .64
	9	40	612.500	.53	1.19	1.19	65	77	80	71	65	50	3.0	—	-.26	
	10	45	615.000	.53	1.19	1.19	65	78	81	71	65	49	3.0	—	-.24	
	11	50	617.890	.53	1.19	1.19	65	77	82	71	65	48	3.0	—	-.22	
	12	55	620.770	.50	1.13	1.13	65	72	82	71	64	48	3.0	—	-.22	
	1	60	623.565	.68	1.53	1.53	65	77	77	70	65	51	3.5	—	-.48	
	2	65	626.850	.71	1.60	1.60	67	73	84	71	66	45	3.5	—	-.52	
	3	70	630.250	.71	1.60	1.60	67	75	85	72	66	46	3.5	—	-.52	Avg .51
	4	75	633.650	.71	1.60	1.60	67	77	85	72	66	48	3.5	—	-.54	
2.3	5	80	~~637.045~~ [illegible]	.69	1.59	1.59	68	77	84	73	66	49	3.5	—	-.56	
	6	85	640.440	.62	1.43	1.43	68	77	84	73	66	44	3.5	—	-.58	
	7	90	643.685	.49	1.13	1.13	68	77	83	73	66	50	3.0	—	-.56	
	8	95	646.585	.65	1.50	1.50	68	73	83	73	67	49	3.5	—	-.52	
	9	100	649.885	.78	1.79	1.79	68	77	84	73	67	49	4.0	—	-.52	
	10	105	653.480	.84	1.93	1.93	68	77	84	73	67	49	4.0	—	-.52	
	11	110	657.255	.86	1.98	1.98	68	77	85	73	67	50	4.25	—	-.50	
	12	115	661.100	.73	1.68	1.68	69	77	85	73	67	50	3.75	—	-.30	
	Final	120	664.635													

Nomograph Calibration Variables ΔH@ 1.822 Cp 0.84 Ts Tm Ps Pm ΔP Bws

Comments: PAUSE PC @ 14:38 - 15:01 LEAK ✓ 623.565 - 623.583 = -0.018

NOTE- METER @ 80 MIN. IS 637.045

Test Observers -

Job Number: 070920 A
Done By / Date: CG - 9/27/07
Final Check By / Date: PC 9/21/07

Method 4 Moisture Recovery

Plant Name	Bf Goodrich Plating	Shop Balance ID - A-BAL-	--	Prepared By	--
Location	P001 Exhaust Stack (A)	Field Balance ID - A-BAL-	007	Preparation Date	--

Run Number	1	2	3	4
Run Date	9-27-07	9-27-07	9-27-07	
Analysis Date	9-27-07	9-27-07	9-27-07	
Time of Analysis	12:02	14:19	16:25	
Turbidity / Color (Clear, Cloudy, Suspended Particulates, etc.)	clear/none	clear/none	clear/none	
Impinger #1				
Final Weight (g)	707.6	628.0	706.7	
Tared Weight (g)	687.5	611.3	689.9	
Condensed H_2O (g)	20.1	16.7	16.8	
Impinger #2				
Final Weight (g)	666.3	679.2	670.3	
Tared Weight (g)	661.9	673.3	665.4	
Condensed H_2O (g)	4.4	5.9	4.9	
Impinger #3				
Final Weight (g)	574.2	586.4	589.6	
Tared Weight (g)	572.5	584.6	587.8	
Condensed H_2O (g)	1.7	1.8	1.6	
Total Condensed (g)	26.2	24.4	23.3	
SILICA GEL				
Final Weight (g)	936.2	835.6	881.7	
Tared Weight (g)	920.5	820.1	867.2	
Adsorbed H_2O (g)	15.7	15.5	14.5	
Total H_2O Collected (g)	41.9	39.9	37.8	

Job Number: 070920 A
Done By / Date: AS / 9-27-07
Checked By / Date: RV / 10/22/07
Final Check By / Date: TJ / 10-23-07

Air Compliance Testing, Inc.
(method 4.xls-Moisture Recovery) 9/13/2007

Plant Name Bf Goodrich Plating Location P001

Reagents Prepared By AS / Date

	Run 1	Run 2	Run 3
Run Date	9/27/07	9/27/07	9/27/07
Analysis Date	9/27/07	9/27/07	9/27/07
Time of Analysis	12:02	14:19	16:25
IMPINGER #1			
Final Weight (g)	707.6	628.0	706.7
Tared Weight (g)	687.5	611.3	689.9
Condensed H_2O (ml,g)	20.1	16.7	16.8
IMPINGER #2			
Final Weight (g)	666.3	679.2	670.3
Tared Weight (g)	661.9	673.3	665.4
Condensed H_2O (ml,g)	4.4	5.9	4.9
IMPINGER #3			
Final Weight (g)	574.2	586.4	589.4
Tared Weight (g)	572.5	584.6	587.8
Condensed H_2O (ml,g)	1.7	1.8	1.6
Total Condensed (ml,g)	26.2	24.4	23.3
SILICA GEL			
Final Weight (g)	936.2	835.6	881.7
Tared Weight (g)	920.5	820.1	867.2
Adsorbed H_2O (ml,g)	15.7	15.5	14.5
Total H_2O Collected (ml,g)	41.9	39.9	37.8

Analytical Balance ID A - BAL - 007

Method 1 - Cyclonic Flow Determination

Plant Name	Bf Goodrich Plating
City, State	Cleveland, OH
Test Location	P001 Exhaust Stack (A)
Pitot I.D. - T- PIT-I61	Manometer I.D. - T- MTB-011 / Umbilical I.D. T- M2U-508

Run Number - 1	Run Number -	Run Number -
Date - 9/26/07	Date -	Date -
Bar. Pres. (in. Hg)- 29.13	Bar. Pres. (in. Hg)-	Bar. Pres. (in. Hg)-
Barometer ID- DPG-004	Barometer ID-	Barometer ID-
Start Time - 15:45/15:56	Start Time -	Start Time -
Finish Time - 15:52/16:01	Finish Time -	Finish Time -
Manometer Zero and Level - Yes ☑	Manometer Zero and Level - Yes ☐	Manometer Zero and Level - Yes ☐
Apparatus Leak Check - Done By: KG	Apparatus Leak Check - Done By:	Apparatus Leak Check - Done By:
Pre Impact Side - Pass ☑	Pre Impact Side - Pass ☐	Pre Impact Side - Pass ☐
Pre Static Side - Pass ☑	Pre Static Side - Pass ☐	Pre Static Side - Pass ☐

Test Point	Notes	Yaw Angle (°)	Test Point	Notes	Yaw Angle (°)	Test Point	Notes	Yaw Angle (°)
1	NE	-13	1			1		
2		-11	2			2		
3		-12	3			3		
4		-10	4			4		
5		-9	5			5		
6		-12	6			6		
7		+9	7			7		
8		+20	8			8		
9	SE	+22	9			9		
10		+21	10			10		
11		+23	11			11		
12	15:25	+21	12			12		
13	SE	-14	13			13		
14		-14	14			14		
15		-11	15			15		
16		-11	16			16		
17		-12	17			17		
18		-14	18			18		
19		+16	19			19		
20		+19	20			20		
21		+21	21			21		
22		+20	22			22		
23		+19	23			23		
24	15:58	+16	24			24		
25			25			25		
	Avg.	15.92		Avg.			Avg.	

Apparatus Leak Check - Done By: KG/GG	Apparatus Leak Check - Done By:	Apparatus Leak Check - Done By:
Post Impact Side - Pass ☑	Post Impact Side - Pass ☐	Post Impact Side - Pass ☐
Post Static Side - Pass ☑	Post Static Side - Pass ☐	Post Static Side - Pass ☐

Note: Yaw angle average is the sum of the absolute values divided by the number of measurements, and must be ≤ 20°.
Yaw angle is the angle measured from the point where zero ΔP should be obtained to the point where zero ΔP is actually obtained

Job Number: 070920 A
Done By / Date: KG / 9/26
Checked By / Date: RU / 10/22/07
Final Check By / Date: TJ / 10-23-07

Air Compliance Testing, Inc.
(Method 2.xls-Cyclonic Flow Determination) 9/13/2007

Method 1 Preliminary Field Data-Round - Round Stack

Plant: Bf Goodrich Plating
City, State: Cleveland, OH
Location: P001 Exhaust Stack (A)

144
7,5
12' 7.5''
151.5

Duct Depth (Inner Diameter)	Port 1	Port 2	Port 3	Port 4
Relative Location	NE	SE		
From Far Inside Wall to Outside of Port (in.)	47.0	48.0		
Nipple Length and/or Wall Thickness (in.)	2	2		
Nipple Protrusion (in.)	0	0		
Stack or Duct Depth (Inner Diameter) (in.)	47.8	47.8		
Stack Outer Circumference (in.)	151.5	151.5		
Port Hole Inner Diameter (in.)	3.5	3.5		

Elevation of Meter Box from Ground Level (ft)	57.0
Elevation of Ports from Ground Level (ft)	57.0
Number of Ports	2
Direction of Flow	↑
Isokinetic Sample (Yes / No)	yes
Stack Particulate Build-up (Yes / No)	no

Distance Upstream from Flow Disturbance (in.)	24.0
Diameters Upstream from Flow Disturbance (≥ 0.5 D_e)	0.50
Minimum Traverse Points Needed *	24

Distance Downstream from Flow Disturbance (in.)	105
Diameters Downstream from Flow Disturbance (≥ 2 D_e)	2.20
Minimum Traverse Points Needed *	24

*Circle Larger of the Two

Stack or Duct Area = 1794.51 in.^{2}

Location of Points in Circular Stacks or Ducts

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.5	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9

Note:

1) Stacks having a diameter greater than 24in, shall have no traverse points located within 1.0in of the Stack walls.

2) Stacks having a diameter less than or equal to 24in, shall have no traverse points located within .50in of the Stack walls

3) Add nipple protrusion length to Point 1 only
Actual nipple length = (length - protrusion

Relocate to a distance equal to the inside diameter of the nozzle being used or to the above minimum distances, whichever is larger

Job Number: 070920 A
Done By / Date: KG / 9/26/07
Checked By / Date: RU / 10/12/07
Final Check By / Date: [illegible] / 10-23-07

Port Number	1	2	3	4	5	6	7
Relative Location	NE	SE					
From Far Wall to Outside of Port (in.)	48.00	48.00					
Nipple Length or Wall Thickness (in.)	0.20	0.20					
Port Protrusion Length (opt) (in.)	0.00	0.00					
Depth of Stack or Duct (in.)	47.80	47.80					
Stack or Duct Type	Circular						
Port Hole Inner Diameter (in.)	3.5						
Stack or Duct Width (If Rectangular) (in.)				#N/A			
Stack Outer Circumference (in.)	151.5						
Number of Ports	2.0						
Elevation of Ports from Ground Level (ft)	57.0						

Note:

1) Stacks having a diameter greater than 24in, shall have no traverse points located within 1.0in of the Stack walls.

2) Stacks having a diameter less than or equal to 24in, shall have no traverse points located within .50in of the Stack walls.

3) Add nipple protrusion length to Point 1 only. Actual nipple length = (length - protrusion)

Equivalent Diameter = D_e (in.)

$$De = \frac{2 \times (\text{Depth} \times \text{Width})}{(\text{Depth} + \text{Width})} = \_\_$$

Relocate to a distance equal to the inside diameter of the nozzle being used or to the above minimum distances, whichever is larger.

"Velocity" or "Particulate" Traverse: Particulate

Distance Upstream from Flow Disturbance (in.)	24.0
Diameters Upstream from Flow Disturbance (* 0.5 De)	0.50
Minimum Traverse Points Needed for a Velocity Traverse *	16
Minimum Traverse Points Needed for a Particulate Traverse *	24

Distance Downstream from Flow Disturbance (in.)	105.0
Diameters Downstream from Flow Disturbance (* 2 De)	2.20
Minimum Traverse Points Needed for a Velocity Traverse *	16
Minimum Traverse Points Needed for a Particulate Traverse *	24

Number of Ports: ____________
Direction of Flow: ____________
Isokinetic Sample: Yes / No ____________
Stack Build-up: Yes / No ____________

Minimum Traverse Points	24
Traverse Point Overide	
Duct Area - in^2	1794.51
Duct Area - ft^2	12.4619
Diameter Check via Circumference (in.)	48.2239

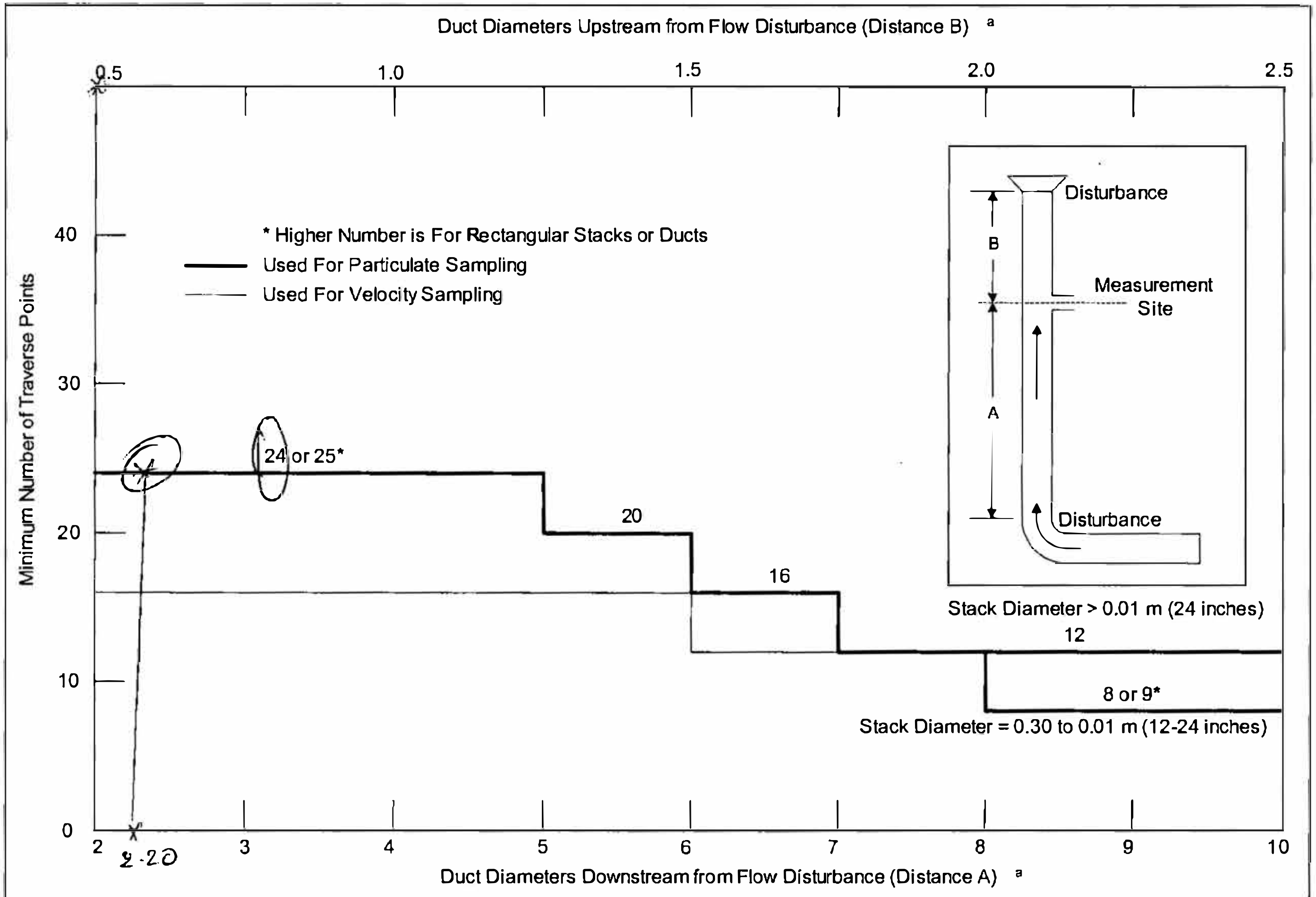
Port	Point	% of Duct Depth	Dist. From inside Wall (Decimal)	Dist. From Outside Wall (Decimal)
1	1	2.1	1.0	1.2
1	2	6.7	3.2	3.4
1	3	11.8	5.6	5.8
1	4	17.7	8.5	8.7
1	5	25	12.0	12.2
1	6	35.6	17.0	17.2
1	7	64.4	30.8	31.0
1	8	75	35.9	36.1
1	9	82.3	39.3	39.5
1	10	88.2	42.2	42.4
1	11	93.3	44.6	44.8
1	12	97.9	46.8	47.0
2	1	2.1	1.0	1.2
2	2	6.7	3.2	3.4
2	3	11.8	5.6	5.8
2	4	17.7	8.5	8.7
2	5	25	12.0	12.2
2	6	35.6	17.0	17.2
2	7	64.4	30.8	31.0
2	8	75	35.9	36.1
2	9	82.3	39.3	39.5
2	10	88.2	42.2	42.4
2	11	93.3	44.6	44.8
2	12	97.9	46.8	47.0

Location of Points in Circular Stacks or Ducts

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.5	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9

Location of Points in Rectangular Stacks or Ducts

Method 1 Criteria Data



[a] From point of any type of disturbance (bend, expansion contraction, etc.)

Test Location P001 Exhaust Stack (A)

Job Number: 070920 A
Done By / Date: KG 9/26/07
Checked By / Date: PL 10/22/07
Final Check By / Date:

TEST DATA

	Run 1	Run 2	Run 3	Average
Number of Test Runs	3			
Traverse Points	24			
Stack Cross-Sectional Diameter 1 (circular) (in)	47.50	47.50	47.50	47.50
Stack Cross-Sectional Diameter 2 (circular) (in)	47.60	47.60	47.60	47.60
Pitot Tube Coefficient (Cp)	0.84	0.84	0.84	0.84
Barometric Pressure at Ground Level (Pbar) (in Hg)	29.17	29.17	29.17	29.17
Elevation Difference Between Ground Level and Meter Box Locations (ft)	57.00	57.00	57.00	57.00
Elevation Difference Between Ground Level and Sampling Locations (ft)	57.00	57.00	57.00	57.00
Initial Dry Gas Meter Reading (ft3)	734.375	814.426	897.709	
Final Dry Gas Meter Reading (ft3)	813.984	895.699	977.028	
Dry Gas Meter Calibration Factor (Gamma)	0.9957	0.9957	0.9957	0.9957
Dry Gas Meter Calibration Coefficient (Delta H@)	1.808	1.808	1.808	1.808
Total Sampling Run Time (Theta) (min)	120	120	120	120
Volume of Water Vapor Condensed in the Impingers (g)	26.7	25.8	23.6	25.4
Weight of Water Vapor Collected in Silica Gel (g)	16.9	15.5	14.9	15.8

Average Pitot Rotation Angle		
	Port Number 1	15.4
	Port Number 2	13.8

	Run 1	Run 2	Run 3
Test Run Start Time (hrmin)	8:26	10:52	13:38
Test Run Stop Time (hrmin)	10:36	13:03	16:01

DETAILED RESULTS

Stack Gas Conditions

	Run 1	Run 2	Run 3	Average
Stack Cross-Sectional Area (A) (ft2)	12.332	12.332	12.332	12.332
Barometric Pressure at Sampling Location (in Hg)	29.12	29.12	29.12	29.12
Dry Molecular Weight of Stack Gas (Md) (lb/lb-mole)	29.00	29.00	29.00	29.00
Wet Molecular Weight of Stack Gas (Ms) (lb/lb-mole)	28.71	28.73	28.74	28.73
Average Absolute Stack Gas Pressure (Ps) (in Hg)	29.09	29.09	29.09	29.09
Average Stack Gas Static Pressure (ps) (in H2O)	-0.29	-0.33	-0.31	-0.31
Average Stack Gas Temperature (ts) (°F)	77.6	76.5	76.5	76.9
Average Stack Gas Temperature (Ts) (°R)	537.6	536.5	536.5	536.9
Average Stack Gas Velocity (Vs) (ft/sec)	48.46	47.88	47.51	47.95
Average Stack Gas Velocity (Vs) (ft/min)	2,907	2,873	2,851	2,877
Wet Volumetric Stack Gas Flow at Actual Conditions (Qaw) (acfm)	35,852	35,429	35,156	35,479
Wet Volumetric Stack Gas Flow at Standard Conditions (scfm)	34,241	33,902	33,642	33,928
Dry Volumetric Stack Gas Flow at Standard Conditions (Qstd) (dscfm)	33,346	33,077	32,858	33,094
Percent by Volume Moisture as measured in Stack Gas (%H2O)	2.61	2.43	2.33	2.46

Test Results

	Run 1	Run 2	Run 3	Average
Volume of Dry Gas Sampled at Standard Conditions (Vmstd) (dscf)	76.594	78.143	76.110	76.949
Rate of Dry Gas Sampled at Standard Conditions (dscfm)	0.638	0.651	0.634	0.641
Predicted 1-Hour Sample Volume Based on Current Sampling Rate (dscf)	38.297	39.072	38.055	38.475
Dry Mole Fraction of Flue Gas (Mfd) (1-bw/100)	0.974	0.976	0.977	0.975
Average Velocity Pressure (Delta P) (in H2O)	0.7079	0.6958	0.6879	0.6972
Average Square Root of Delta P	0.8411	0.8323	0.8260	0.8331
Average Pressure Differential of Orifice Meter (Delta H) (in H2O)	1.5104	1.5563	1.4938	1.5201
Average DGM Temperature (tm) (°F)	73.750	74.167	75.167	74.361
Average Dry Gas Meter Temperature (Tm) (°R)	533.750	534.167	535.167	534.361
Volume of Metered Gas Sample (Vm) (dry) (acf)	79.609	81.273	79.319	80.067
Post-Test Calibration (Yqa)	1.0506	1.0449	1.0500	1.0485
Post-Test/Pre-Test Calibration Factor Difference (%)	**-5.51**	-4.94	**-5.45**	-5.30

SAMPLING QA

	Run 1	Run 2	Run 3	Average
Current Predicted Allowable Post-Test Leak Rate (dscfm)	0.020	0.020	0.020	0.020
Current Sampling Rate Status	**OK**	**OK**	**OK**	
Probe Nozzle Diameter (in)	0.213	0.212	0.213	0.213
Percent Isokinetic of Sampling Rate (% I)	95.4	99.0	96.2	96.9
In Field Isokinetic QA	**GOOD**	**GOOD**	**GOOD**	
Count of Velocity Pressure Readings Below 0.05 in H2O	0	0	0	0
Sensitivity Factor for Differential Pressure Gauge (T)	1.001	1.004	1.004	1.003
Is Meter Box Manometer Adequate (Yes / No) ?	YES	YES	YES	

MEASURED DATA FROM TEST RUNS

Point Count	Run #	Run Time (min)	Pitot Delta P (in H2O)	Square Root of Delta P	Orifice Delta H (in H2O)	DGM Temp OUT (°F)	Stack Pressure (in H2O)	Stack Temp (°F)
1	1	0	0.69	0.831	1.40	69	-0.29	78
2	1	5	0.71	0.843	1.45	70	-0.29	78
3	1	10	0.73	0.854	1.50	71	-0.29	78
4	1	15	0.77	0.877	1.60	73	-0.30	79
5	1	20	0.82	0.906	1.70	74	-0.32	79
6	1	25	0.82	0.906	1.70	75	-0.31	80
7	1	30	0.60	0.775	1.20	75	-0.30	80
8	1	35	0.72	0.849	1.50	76	-0.33	80
9	1	40	0.80	0.894	1.70	76	-0.38	80
10	1	45	0.86	0.927	1.80	77	-0.38	79
11	1	50	0.86	0.927	1.80	77	-0.29	79
12	1	55	0.66	0.860	1.30	76		79
13	1	60	0.57	0.755	1.20	73	-0.22	73
14	1	65	0.58	0.762	1.25	74	-0.21	75
15	1	70	0.57	0.755	1.20	73	-0.12	77
16	1	75	0.59	0.768	1.30	73	-0.21	78
17	1	80	0.62	0.787	1.30	73	-0.24	78
18	1	85	0.58	0.762	1.30	73	-0.24	73
19	1	90	0.62	0.787	1.40	73	-0.32	73
20	1	95	0.70	0.837	1.60	73	-0.32	76
21	1	100	0.80	0.894	1.80	73	-0.34	78
22	1	105	0.86	0.927	1.95	74	-0.36	79
23	1	110	0.84	0.917	1.90	74	-0.26	79
24	1	115	0.62	0.787	1.40	75		74
25	2	0	0.56	0.748	1.30	74	-0.21	80
26	2	5	0.56	0.748	1.30	74	-0.22	75
27	2	10	0.56	0.748	1.30	74	-0.20	74
28	2	15	0.56	0.748	1.30	75	-0.20	76
29	2	20	0.60	0.775	1.40	75	-0.26	79
30	2	25	0.62	0.787	1.45	75	-0.34	79
31	2	30	0.65	0.806	1.50	75	-0.42	79
32	2	35	0.72	0.849	1.60	75	-0.52	74
33	2	40	0.81	0.900	1.78	75	-0.48	73
34	2	45	0.85	0.922	1.87	74	-0.42	75
35	2	50	0.81	0.900	1.80	75	-0.19	78
36	2	55	0.76	0.872	1.70	75		79
37	2	60	0.64	0.800	1.41	73	-0.24	73
38	2	65	0.68	0.825	1.50	73	-0.25	76
39	2	70	0.68	0.825	1.50	73	-0.29	78
40	2	75	0.70	0.837	1.55	73	-0.31	79
41	2	80	0.77	0.877	1.70	74	-0.35	79
42	2	85	0.72	0.849	1.58	74	-0.32	73
43	2	90	0.60	0.775	1.32	74	-0.42	72
44	2	95	0.70	0.837	1.55	74	-0.46	76
45	2	100	0.81	0.900	1.80	74	-0.42	78
46	2	105	0.82	0.906	1.80	74	-0.38	79
47	2	110	0.82	0.906	1.80	74	-0.36	79
48	2	115	0.70	0.837	1.54	74		73

MEASURED DATA FROM TEST RUNS

Point Count	Run #	Run Time (min)	Pitot Delta P (in H2O)	Square Root of Delta P	Orifice Delta H (in H2O)	DGM Temp OUT (°F)	Stack Pressure (in H2O)	Stack Temp (°F)
49	3	0	0.64	0.800	1.34	70	-0.27	76
50	3	5	0.67	0.819	1.40	71	-0.28	78
51	3	10	0.68	0.825	1.43	72	-0.30	78
52	3	15	0.70	0.837	1.48	73	-0.32	79
53	3	20	0.77	0.877	1.62	73	-0.34	73
54	3	25	0.73	0.854	1.53	74	-0.30	72
55	3	30	0.61	0.781	1.28	74	-0.34	76
56	3	35	0.77	0.877	1.62	74	-0.38	79
57	3	40	0.64	0.800	1.41	78	-0.32	79
58	3	45	0.88	0.938	1.94	75	-0.32	79
59	3	50	0.84	0.917	1.85	76	-0.26	73
60	3	55	0.68	0.825	1.50	76		72
61	3	60	0.55	0.742	1.11	75		75
62	3	65	0.57	0.755	1.20	74	-0.24	74
63	3	70	0.46	0.678	0.97	75	-0.24	77
64	3	75	0.55	0.742	1.21	75	-0.24	78
65	3	80	0.60	0.775	1.32	76	-0.26	79
66	3	85	0.52	0.721	1.14	77	-0.28	79
67	3	90	0.56	0.748	1.23	77	-0.38	72
68	3	95	0.65	0.806	1.43	77	-0.39	74
69	3	100	0.85	0.922	1.87	77	-0.39	78
70	3	105	0.90	0.949	2.07	78	-0.40	79
71	3	110	0.87	0.933	2.00	78	-0.22	78
72	3	115	0.82	0.906	1.90	79		79

TEST DATA

CONCENTRATION CALCULATIONS

Calculate the Total ug's of Cr in Each Sample

	Run 1	Run 2	Run 3	Average
Vml (Volume of impinger plus rinses) (ml)	477	476	474	476
C (Concentration of Cr in sample) (ug Cr/ml)	0.02500	0.01940	0.02270	0.02237
F (Dilution Factor=Vol.of aliquot after dilution/Vol. of aliquot before dilution) (ml/ml)	1.0	1.0	1.0	1.0
D (Digestion Factor=Vol. of sample aliquot after digestion / Vol. of sample aliquot submitted to digestion)(ml/ml)	0.500	0.500	0.500	0.500
(Digestion Factor is typically 0.5)				
Total Cr in each field sample (ug)	5.96	4.62	5.38	5.32

Chromium Emission Results

	Run 1	Run 2	Run 3	Average
Vmstd (Dry Standard Volume Metered on DGM) (dscm)	2.169	2.213	2.155	2.179
Measured Chromium Concentration (mg/dscm)	0.00275	0.00209	0.00250	0.00244
Chromium Concentration (lb/dscf)	1.716E-10	1.303E-10	1.558E-10	1.526E-10
Chromium Emission Rate (lb/hr)	0.00034	0.00026	0.00031	0.00030
Chromium Concentration (ppmv)	0.00127	0.00097	0.00115	0.00113
Chromium Emission Rate (mg/hr)	155.75	117.27	139.36	137.46

EPA Methods 1, 2, 4, and 306 Nomenclature and Sample Calculations
Run No. - 1

Constants

CO_2F_{wt} = 44.0	in wg= 0.073529	NO_2F_{wt} = 46.01	$HClF_{wt}$ = 36.46
O_2F_{wt} = 32.0	gr= 0.000142857	COF_{wt} = 28.01	SO_2F_{wt} = 64.06
CON_2F_{wt} = 28.0	mmBtu= 1000000 Btu	$H_2SO_4F_{wt}$ = 98.08	Cl_2F_{wt} = 70.91
H_2OF_{wt} = 18.0	CF_{wt} = 12.011	T_{std} = 528	P_{std} = 29.92

Stack Variables

Cp =	0.84	pitot tube coefficient (dimensionless)
P_{bar} =	29.17 in. Hg	barometric pressure
E_{box} =	57 ft	elevation difference between ground level and meter box
E_{sam} =	57 ft	elevation difference between ground level and sampling ports
γ =	0.9957	gamma, dry gas meter calibration factor (dimensionless)
θ =	120.0 min	net run time (minutes)
V_{lc} =	43.6 g	total mass of liquid collected in impingers (g)
A =	12.3318 ft^2	stack cross-sectional area
P_g =	-0.29 in. H_2O	flue gas static pressure
T_{savg} =	537.58 R	average absolute flue gas temperature (460R+tsavg °F)
$SQ\Delta P_{avg}$ =	0.84 in. wg	average square root ΔP
ΔH =	1.51 in. wg	average pressure differential of orifice meter
T_m =	533.75 R	dry gas meter temperature (460R+tsavg °F)
V_m =	79.61 ft^3	volume of metered gas sample (dry actual cubic feet)
D_n =	0.213 in.	sampling nozzle diameter

Calculated Stack Variables

Barometric pressure at sampling location

NOTE: Barometric pressure recorded at ground level

$P_{sam} = P_{bar} - [(E_{sam} / 100 \text{ ft}) * 0.1 \text{ in. Hg}]$

$P_{sam} = 29.17 - ((57.0 / 100) * 0.1)$

$P_{sam} =$ 29.12 in. Hg

Volume of dry gas sampled at standard conditions (dscf)

$V_{mstd} = \gamma * Vm * [P_{bar} - ([(E_{box} / 100 \text{ ft}) * 0.1 \text{ in. Hg}] + (\Delta H / 13.6)) / P_{std}] * (T_{std} / T_m)$

$V_{mstd} = 0.9957 * 79.609 * ((29.17 - ((57.0 / 100) * 0.1) + (1.5104 / 13.6)) / 29.92) * (528.0 / 533.750)$

$V_{mstd} =$ 76.594 ft^3

Volume of water vapor at standard conditions (68 °F, scf)

$V_{wstd} = (0.04715 \text{ ft}^3/\text{g}) * Vlc$

$V_{wstd} = (0.04715 * 43.6)$

$V_{wstd} =$ 2.1 ft^3

Percent moisture by volume as measured in flue gas

$\%H_2O$ (Measured) $= 100 * [V_{wstd} / (V_{wstd} + V_{mstd})]$

$\%H_2O$ (Measured) $= 100 * (2.056 / (2.056 + 76.594))$

$\%H_2O$ (Measured) = 2.61

Absolute flue gas pressure

$P_s = P_{sam} + (Pg / 13.6)$

$P_s = 29.12 + (-0.29 / 13.6)$

$P_s =$ 29.09 in. Hg

Dry mole fraction of flue gas (dimensionless)

$M_{fd} = 1 - (\%H_2O / 100)$

$M_{fd} = 1 - (2.61 / 100)$

$M_{fd} =$ 0.974

Dry molecular weight of flue gas (lb/lb-mole)

$M_d = [(\%CO_2 / 100) * 44.0] + [(\%O_2 / 100) * 32.0] + [((100 - \%CO_2 - \%O_2) / 100) * 28.0]$

$M_d = ((0.00 / 100) * 44.0) + ((0.00 / 100) * 32.0) + (((100 - 0.00 - 0.00) / 100) * 28.0)$

$M_d =$ 28.00 lb/lb-mole

$M_d =$ 29.00

Wet molecular weight of flue gas (lb/lb-mole)

$M_s = M_d * M_{fd} + (H_2OF_{wt} * (\%H_2O / 100))$

$M_s = 29.000 * 0.974 + 18.00 * (2.61 / 100)$

$M_s =$ 28.71 lb/lb-mole

Average flue gas velocity (ft/sec)

$v_s = 85.49 * Cp * (SQ\Delta P_{avg}) * (T_{avg} / (P_s * M_s))^{0.5}$

$v_s = 85.49 * 0.84 * (0.8411) * (537.58 / (29.094 * 28.712)) \wedge 0.5$

$v_s =$ 48.46 ft/sec

Wet volumetric flue gas flow rate at actual conditions (acfm)

$Q_{aw} = v_s * A * 60$ sec/min

$Q_{aw} = 48.455 * 12.332 * 60$

$Q_{aw} =$ 35,852 ft^3/min

Wet volumetric flue gas flow rate at standard conditions (scfm)

$Q_{sdw} = v_s * A * (T_{std} / T_{savg}) * (P_s / P_{std}) * 60$ sec/min

$Q_{sdw} = 48.455 * 12.332 * (528.0 / 537.583) * (29.094 / 29.92) * 60$

$Q_{sdw} =$ 34,241 ft^3/min

Dry volumetric flue gas flow rate at standard conditions (dscfm)

$Q_{sd} = M_{fd} * v_s * A * (T_{std} / T_{savg}) * (P_s / P_{std}) * 60$ sec/min

$Q_{sd} = 0.974 * 48.4551 * 12.3318 * (528.0 / 537.583) * (29.094 / 29.92) * 60$

$Q_{sd} =$ 33,346 ft^3/min

Isokinetic Calculations

Percent isokinetic of sampling rate (%)

$$\%I = (P_{std} / T_{std}) * (T_{savg} / P_s) * [V_{mstd} / (v_s * M_{fd} * \theta * \pi * (D_n / 2)^2)]$$

$$\%I = ((((29.92 / 528.0) * (537.583 / 29.094)) * (76.594 / (48.4551 * 0.974 * 120.0 * (()3.141593 * (0.213 / 2) ^ 2) / 144))) / 60) * 100$$

$\%I =$ 95.4 %

Method 306 Calculations

Total Cr catch weight (ug)

$ug_{quan} =$ 5.96 ug

Total Cr concentration (mg/dscm)

$C_{grcm} = ug_{quan} /(1000 * V_{mstdm})$

$C_{grcm} = 5.96 / 2.169$

$C_{grcm} =$ 0.002749 mg/dscm

Method 306 I[illegible]inetic Field Data

Plant	Bf Goodrich Plating	Meter box no.	T-MTB- 013	Gamma	.9957
Location	P002 Exhaust Stack (B)	Pump no.	T-PMP- 013	K Factor	2.05/2.1 12.15/2.25
Run no.	1	Nomograph no.	T-NOM—	Nozzle Size, in.	.213
Test start time	8:26	Probe no.	T-PRB- 602	Barometric pressure, in.Hg	29.17 DPG-004
Test stop time	10:36	Filter box no.	T-FLB- 006	Ambient temperature, °F	67°
Pre-test leak rate @ 15in.Hg	.001	Impinger box no.	T-IMB- 009	Filter box temperature setting, °F	ambient
Post-test leak rate @ 3 in.Hg	.001	Umbilical cord no.	T-UMC- 607	Probe temperature setting, °F	ambient
Pre-test pitot leak check - ✓ total ✓ static		Umbilical adapter no.	T-UMA- 012	Orsat flow rate setting, SCFH	—
Post-test pitot leak check - ✓ total ✓ static		Orsat bag no.	—	Meter box operator	GS Date 9-27-07

POINT	CLOCK TIME min	DRY GAS METER CF	PITOT In. H_2O ΔP	ORIFICE ΔH In. H_2O DESIRED	ORIFICE ΔH In. H_2O ACTUAL	PROBE TEMP °F	STACK TEMP °F	DRY GAS TEMP, °F INLET	DRY GAS TEMP, °F OUTLET	OVEN TEMP °F	IMPINGER TEMP °F	PUMP VACUUM in.Hg	ORSAT FLOW SCFH	STATIC PRESSURE ± In.H_2O
1	0	734.275	.69	1.41	1.40	68	78		69	67	56	1.0		-.29
2	5	737.37	.71	1.46	1.45	68	78		70	69	52	1.0		-.29
3	10	740.62	.73	1.49	1.50	69	78		71	68	53	1.0		-.29
4	15	743.94	.77	1.574	1.60	69	79		73	68	56	1.5		-.30
5	20	747.42	.82	1.68	1.70	70	79		74	68	60	1.5		-.32
6	25	751.00	.82	1.68	1.70	70	80		75	69	62	1.5		-.31
7	30	754.17	.6	1.23	1.2	71	80		75	69	52	1.0		-.30
8	35	757.47	.72	1.512	1.5	70	80		76	69	56	1.0		-.33
9	40	760.77	.80	1.64	1.7	69	80		76	69	55	1.5		-.38
10	45	764.34	.86	1.806	1.8	69	79		77	69	54	1.5		-.38
11	50	768.04	.86	1.806	1.8	68	79		77	68	55	1.5		-.29
12	55	771.74	.66	1.32	1.3	68	79		76	68	55	1.0		—
1	60	774.824	.57	1.225	1.2	66	73		73	67	54	1.0		-.22
2	65	777.88	.58	1.247	1.25	66	75		74	67	50	1.0		-.21
3	70	780.85	.57	1.225	1.2	66	77		73	66	49	1.0		-.12
4	75	783.77	.59	1.269	1.3	67	78		73	66	49	1.0		-.21
5	80	786.72	.62	1.333	1.3	67	78		73	66	50	1.0		-.24
6	85	789.74	.59	1.305	1.3	67	73		73	67	50	1.0		-.24
7	90	792.77	.62	1.395	1.4	67	73		73	67	51	1.0		-.32
8	95	795.98	.7	1.575	1.6	67	76		72	67	52	1.5		-.32
9	100	799.52	.8	1.8	1.8	68	78		73	67	52	1.5		-.34
10	105	803.20	.86	1.935	1.95	69	79		74	67	52	2.0		-.36
11	110	807.08	.84	1.89	1.90	69	79		74	68	52	1.7		-.26
12	115	810.77	.62	1.395	1.4	70	74		75	68	53	1.0		—
Final	120	813.984												

Nomograph Calibration Variables ΔH@ 1.808 Cp .84 Ts Tm Ps Pm ΔP Bws

Comments: PC. 9:26 - 9:36 Leak Check 774.824 to 774.924 at port change

Test Observers - =-0.10

Job Number: 070920 B
Done By / Date: ES 9-27-07
Final Check By / Date: PC 9/27/07

Method 306 I[illegible]etic Field Data

Plant	Bf Goodrich Plating	Meter box no.	T-MTB- 013	Gamma	.9957
Location	P002 Exhaust Stack (B)	Pump no.	T-PMP- 013	K Factor	2.3 / 2.21
Run no.	2	Nomograph no.	T-NOM- —	Nozzle Size, in.	.212
Test start time	10:52 :13	Probe no.	T-PRB- 603	Barometric pressure, in.Hg	29.17 ORG -.004
Test stop time	13:03	Filter box no.	T-FLB- 004	Ambient temperature, °F	68
Pre-test leak rate @ 15in.Hg	~~.004~~ .003	Impinger box no.	T-IMB- 021	Filter box temperature setting, °F	ambient
Post-test leak rate @ 2 in.Hg	.003	Umbilical cord no.	T-UMC- 607	Probe temperature setting, °F	ambient
Pre-test pitot leak check - ✓ total ✓ static		Umbilical adapter no.	T-UMA- 020	Orsat flow rate setting, SCFH	—
Post-test pitot leak check - ✓ total ✓ static		Orsat bag no.	—	Meter box operator	ES Date 9-22-07

POINT	CLOCK TIME min	DRY GAS METER CF	PITOT In. H_2O ΔP	ORIFICE ΔH In. H_2O DESIRED	ORIFICE ΔH In. H_2O ACTUAL	PROBE TEMP °F	STACK TEMP °F	DRY GAS TEMP, °F INLET	DRY GAS TEMP, °F OUTLET	OVEN TEMP °F	IMPINGER TEMP °F	PUMP VACUUM In.Hg	ORSAT FLOW SCFH	STATIC PRESSURE ± In.H_2O
1	0	814.287	.56	1.288	1.3	70	80	—	74	70	60	1.0		-.21
2	5	817.45	.56	1.288	1.3	70	75		74	70	57	1.0		-.22
3	10	820.59	.56	1.288	1.3	70	74		74	69	53	1.0		-.20
4	15	823.74	.56	1.288	1.3	70	76		75	69	53	1.0		-.20
5	20	826.90	.60	1.38	1.4	70	79		75	69	52	1.0		-.26
6	25	830.11	.62	1.426	1.45	69	79		75	68	52	1.0		-.34
7	30	833.32	.65	1.495	1.5	69	79		75	68	52	1.0		-.42
8	35	836.66	.72	1.584	1.6	68	74		75	68	52	1.0		-.52
9	40	840.19	.81	1.78	1.78	68	73		75	68	53	1.0		-.48
10	45	843.88	.85	1.87	1.87	68	75		74	67	53	1.0		-.42
11	50	847.67	.81	1.78	1.80	68	78		75	68	54	1.0		-.19
12	55	851.33	.76	1.672	1.70	68	79		75	67	54	1.0		—
1	60	85[illegible]	.64	1.408	1.41	67	73		73	67	55	1.0		-.24
2	67	858.29	EST .68	1.496	1.50	67	76		73	67	52	1.0		-.25
3	70	861.44	.68	1.496	1.50	68	78		73	67	52	1.0		-.29
4	75	864.79	.70	1.54	1.55	68	79		73	67	53	1.0		-.31
5	80	868.10	.77	1.694	1.70	68	79		74	67	54	1.0		-.35
6	85	871.61	.72	1.584	1.58	69	73		74	67	55	1.0		-.32
7	90	875.00	.60	1.32	1.32	68	72		74	67	56	1.0		-.42
8	95	878.09	.70	1.54	1.55	68	76		74	67	57	1.0		-.46
9	100	881.31	.81	1.78	1.80	68	78		74	67	58	1.0		-.42
10	105	885.03	.82	1.804	1.80	68	79		74	67	57	1.0		-.38
11	110	888.73	.82	1.804	1.80	68	79		74	66	57	1.0		-.36
12	115	892.41	.70	1.54	1.54	68	73		74	66	57	1.0		—
Final	120	895.699												

Nomograph Calibration Variables ΔH@ 1.808 Cp .84 Ts Tm Ps Pm ΔP Bws

Comments: l.c. 11:52 – 12:03 854.889 +0 855.028

= -0.139

Test Observers -

~~leak~~ leak check halfway

Job Number: 070920 B

Done By / Date: ES 9-27-07

Final Check By / Date: RU 10/24/07

Method 306 i[illegible] [illegible]inetic Field Data

Plant	Bf Goodrich Plating	Meter box no.	T-MTB- 013	Gamma	.9957
Location	P002 Exhaust Stack (B)	Pump no.	T-PMP- 013	K Factor	2.1 / 2.2 / 2.2/2.3
Run no.	3	Nomograph no.	T-NOM- —	Nozzle Size, in.	.213
Test start time	13:38	Probe no.	T-PRB- 602	Barometric pressure, in.Hg	29.17 OPG .004
Test stop time	16:01	Filter box no.	T-FLB- 006	Ambient temperature, °F	68°
Pre-test leak rate @ 15in.Hg	.002	Impinger box no.	T-IMB- 005	Filter box temperature setting, °F	ambient
Post-test leak rate @ 4 in.Hg	.001	Umbilical cord no.	T-UMC- 607	Probe temperature setting, °F	ambient
Pre-test pitot leak check - ✓ total ✓ static		Umbilical adapter no.	T-UMA- 020	Orsat flow rate setting, SCFH	—
Post-test pitot leak check - ✓ total ✓ static		Orsat bag no.	—	Meter box operator	ES Date 9-22-07

POINT	CLOCK TIME min	DRY GAS METER CF	PITOT In. H_2O ΔP	ORIFICE ΔH In. H_2O DESIRED	ORIFICE ΔH In. H_2O ACTUAL	PROBE TEMP °F	STACK TEMP °F	DRY GAS TEMP, °F INLET	DRY GAS TEMP, °F OUTLET	OVEN TEMP °F	IMPINGER TEMP °F	PUMP VACUUM in.Hg	ORSAT FLOW SCFH	STATIC PRESSURE ± in.H_2O
1	0	896.940	.64	1.34	1.34	66	76		70	66	64	2.0		-.27
2	5	900.02	.67	1.407	1.40	66	78		71	66	61	2.0		-.28
3	10	903.16	.68	1.428	1.43	67	78		72	66	58	2.0		-.30
4	15	906.33	.70	1.47	1.48	67	79		73	66	57	2.0		-.32
5	20	909.50	.77	1.617	1.62	67	73		73	66	58	2.2		-.34
6	25	912.88	.73	1.533	1.53	67	72		74	66	55	2.2		-.30
7	30	916.18	.61	1.281	1.28	66	76		74	66	54	2.0		-.34
8	35	919.55	.77	1.62	1.62	66	79		74	66	53	2.5		-.38
9	40	922.78	.64	1.41	1.41	66	79		75	65	51	2.0		-.32
10	45	926.04	.88	1.936	1.94	66	79		75	65	50	3.0		-.32
11	50	929.81	.84	1.848	1.85	66	73		76	65	52	3.0		-.26
12	55	933.60	.68	1.496	1.50	66	72		76	65	52	2.5		—
1	✓ 60	936.965	.55 .05	~~[illegible]~~ 1.11	~~[illegible]~~ 1.11	67	75		75	66	51	2.0		—
2	65	940.78	.57	1.197	1.2	67	74		74	66	49	2.0		-.24
3	70	943.87	.46	.966	.97	67	77		75	66	50	1.5		-.24
4	75	946.63	.55	1.21	1.21	67	78		75	66	50	1.5		-.24
5	80	949.34	.60	1.32	1.32	67	79		76	66	51	1.8		-.26
6	85	952.46	.52	1.144	1.14	68	79		77	67	51	1.5		-.28
7	90	955.34	.56	1.232	1.23	67	72		77	67	52	1.5		-.38
8	95	958.30	.65	1.43	1.43	68	74		77	67	52	2.0		-.39
9	100	961.49	.85	1.87	1.87	68	78		77	67	52	3.0		-.39
10	105	965.21	.90	2.07	2.07	68	79		78	67	53	3.5		-.40
11	110	969.37	.87	~~1.9~~ 1.920	~~1.9~~ 1.920	68	78		78	67	52	3.5		-.22
12	115	973.16	.82	1.886	1.90	69	79		79	67	54	3.0		—
Final	120	977.028												

Nomograph Calibration Variables ΔH@ Cp Ts Tm Ps Pm ΔP Bws

Comments: P.C. 14:38 - 15:01 leak check 936.965 - 932.734 leak check

Test Observers - Port change - 0.769

Post check .003
Port change

Job Number: 070920 B
Done-By / Date: ES 9-27-07
Final Check By / Date: RW 9/27/07

Method 4 Moisture Recovery

Plant Name Bf Goodrich Plating — Shop Balance ID - A-BAL- — — Prepared By AS

Location P002 Exhaust Stack (B) — Field Balance ID - A-BAL-007 — Preparation Date 9/27/07

Run Number	1	2	3	4
Run Date	9-27-07	9-27-07	9-27-07	
Analysis Date	9-27-07	9-27-07	9-27-07	
Time of Analysis	11:14	14:46	16:45	
Turbidity / Color (Clear, Cloudy, Suspended Particulates, etc.)	clear/ none	clear/none	clear/none	
Impinger #1				
Final Weight (g)	617.5	700.4	620.3	
Tared Weight (g)	599.3	682.7	603.7	
Condensed H_2O (g)	18.2	17.7	16.6	
Impinger #2				
Final Weight (g)	668.7	668.8	683.2	
Tared Weight (g)	663.0	662.9	678.1	
Condensed H_2O (g)	5.7	5.9	5.1	
Impinger #3				
Final Weight (g)	579.4	587.7	580.2	
Tared Weight (g)	576.6	585.5	578.3	
Condensed H_2O (g)	2.8	2.2	1.9	
Total Condensed (g)	26.7	25.8	23.6	
SILICA GEL				
Final Weight (g)	891.4	890.9	899.1	
Tared Weight (g)	874.5	875.4	884.2	
Adsorbed H_2O (g)	16.9	15.5	14.9	
Total H_2O Collected (g)	43.6	41.3	38.5	

Job Number: 070920 B

Done By / Date: AS / 9/27/07

Checked By / Date: DV / 10/22/07

Final Check By / Date: [illegible] / 10/23/07

Plant Name Bf Goodrich Plating Location P002

Reagents Prepared By AS / Date

	Run 1	Run 2	Run 3
Run Date	9/27/07	9/27/07	9/27/07
Analysis Date	9/27/07	9/27/07	9/27/07
Time of Analysis	11:14	14:46	16:45
IMPINGER #1			
Final Weight (g)	617.5	700.4	620.3
Tared Weight (g)	599.3	682.7	603.7
Condensed H_2O (ml,g)	18.2	17.7	16.6
IMPINGER #2			
Final Weight (g)	668.7	668.8	683.2
Tared Weight (g)	663.0	662.9	678.1
Condensed H_2O (ml,g)	5.7	5.9	5.1
IMPINGER #3			
Final Weight (g)	579.4	587.7	580.2
Tared Weight (g)	576.6	585.5	578.3
Condensed H_2O (ml,g)	2.8	2.2	1.9
Total Condensed (ml,g)	**26.7**	**25.8**	**23.6**
SILICA GEL			
Final Weight (g)	891.4	890.9	899.1
Tared Weight (g)	874.5	875.4	884.2
Adsorbed H_2O (ml,g)	16.9	15.5	14.9
Total H_2O Collected (ml,g)	**43.6**	**41.3**	**38.5**

Analytical Balance ID A - BAL - 007

Method 1 - Cyclonic Flow Determination

Plant Name	Bf Goodrich Plating		
City, State	Cleveland, OH		
Test Location	P002 Exhaust Stack (B)		
Pitot I.D. - T- PIT-601		Manometer I.D. - T- MTB-012	Umbilical I.D. T- MZU-510

Run Number -	1	Run Number -		Run Number -	
Date -	9.26.07	Date -		Date -	
Bar. Pres. (in. Hg)-	29.13	Bar. Pres. (in. Hg)-		Bar. Pres. (in. Hg)-	
Barometer ID-	T-DPG-004	Barometer ID-		Barometer ID-	
Start Time -	15:41	Start Time -		Start Time -	
Finish Time -	16:05	Finish Time -		Finish Time -	
Manometer Zero and Level -	Yes ☑	Manometer Zero and Level -	Yes ☐	Manometer Zero and Level -	Yes ☐
Apparatus Leak Check - Done By:	JG	Apparatus Leak Check - Done By:		Apparatus Leak Check - Done By:	
Pre Impact Side -	Pass ☑	Pre Impact Side -	Pass ☐	Pre Impact Side -	Pass ☐
Pre Static Side -	Pass ☑	Pre Static Side -	Pass ☐	Pre Static Side -	Pass ☐

Test Point	Notes	Yaw Angle (°)	Test Point	Notes	Yaw Angle (°)	Test Point	Notes	Yaw Angle (°)
1	S	-23	1			1		
2		-24	2			2		
3		-22	3			3		
4		-20	4			4		
5		-18	5			5		
6		-13	6			6		
7		+11	7			7		
8		14	8			8		
9		15	9			9		
10		15	10			10		
11	15:42	5	11			11		
12		5	12			12		
13		-19	13			13		
14		-17	14			14		
15		-17	15			15		
16		-17	16			16		
17		-16	17			17		
18		-15	18			18		
19		11	19			19		
20		15	20			20		
21		16	21			21		
22		18	22			22		
23		3	23			23		
24	13.83	2	24			24		
25			25			25		
	Avg.	14.63		Avg.			Avg.	

Apparatus Leak Check - Done By:	JG	Apparatus Leak Check - Done By:		Apparatus Leak Check - Done By:	
Post Impact Side -	Pass ☑	Post Impact Side -	Pass ☐	Post Impact Side -	Pass ☐
Post Static Side -	Pass ☑	Post Static Side -	Pass ☐	Post Static Side -	Pass ☐

Note: Yaw angle average is the sum of the absolute values divided by the number of measurements, and must be ≤ 20°.

Yaw angle is the angle measured from the point where zero ΔP should be obtained to the point where zero ΔP is actually obtained

Job Number: 070920 B

Done By / Date: JG / 9.26.07

Checked By / Date: PW / 10/22/07

Final Check By / Date: [illegible] / 10-23-07

Air Compliance Testing, Inc.

(Method 2.xls-Cyclonic Flow Determination) 9/13/2007

Method 1 Preliminary Field Data-Round - Round Stack

Plant: Bf Goodrich Plating
City, State: Cleveland, OH
Location: P002 Exhaust Stack (B)

Duct Depth (Inner Diameter)	Port 1	Port 2	Port 3	Port 4
Relative Location	South	East		
From Far Inside Wall to Outside of Port (in.)	49.6	49.7		
Nipple Length and/or Wall Thickness (in.)	2.1	2.1		
Nipple Protrusion (in.)	0.0	0.0		
Stack or Duct Depth (Inner Diameter) (in.)	47.5	47.6		
Stack Outer Circumference (in.)	–	–		
Port Hole Inner Diameter (in.)	3.5	3.5		

Elevation of Meter Box from Ground Level (ft)	57
Elevation of Ports from Ground Level (ft)	57
Number of Ports	2
Direction of Flow	Upward
Isokinetic Sample (Yes / No)	Yes
Stack Particulate Build-up (Yes / No)	No

Distance Upstream from Flow Disturbance (in.)	29.0
Diameters Upstream from Flow Disturbance (≥ 0.5 D_e)	0.61
Minimum Traverse Points Needed *	24

Distance Downstream from Flow Disturbance (in.)	128.0
Diameters Downstream from Flow Disturbance (≥ 2 D_e)	2.69
Minimum Traverse Points Needed *	24

*Circle Larger of the Two

Stack or Duct Area = 1775.79 in.^{2}

Location of Points in Circular Stacks or Ducts

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.5	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9

Note:
1) Stacks having a diameter greater than 24in, shall have no traverse points located within 1.0in of the Stack walls.

2) Stacks having a diameter less than or equal to 24in, shall have no traverse points located within .50in of the Stack walls

3) Add nipple protrusion length to Point 1 only
Actual nipple length = (length - protrusion

Relocate to a distance equal to the inside diameter of the nozzle being used or to the above minimum distances, whichever is larger

Job Number: 070920 B
Done By / Date: JG / 9.26.07
Checked By / Date: VU / 10/22/07
Final Check By / Date: [illegible] / 10-23-07

Port Number	1	2	3	4	5	6	7
Relative Location	S	E					
From Far Wall to Outside of Port (in.)	49.60	49.70					
Nipple Length or Wall Thickness (in.)	2.10	2.10					
Port Protrusion Length (opt) (in.)	0.00	0.00					
Depth of Stack or Duct (in.)	47.50	47.60					

Stack or Duct Type	Elliptical
Port Hole Inner Diameter (in.)	3.55
Stack or Duct Width (If Rectangular) (in.)	
Stack Outer Circumference (in.)	
Number of Ports	2.0
Elevation of Ports from Ground Level (ft)	57.0

#N/A

Note:

1) Stacks having a diameter greater than 24in, shall have no traverse points located within 1.0in of the Stack walls.

2) Stacks having a diameter less than or equal to 24in, shall have no traverse points located within .50in of the Stack walls.

3) Add nipple protrusion length to Point 1 only. Actual nipple length = (length - protrusion)

Equivalent Diameter = D_e (in.)

$$De = \frac{2 \times (\text{Depth} \times \text{Width})}{(\text{Depth} + \text{Width})} = \text{—}$$

Relocate to a distance equal to the inside diameter of the nozzle being used or to the above minimum distances, whichever is larger.

"Velocity" or "Particulate" Traverse: Particulate

Distance Upstream from Flow Disturbance (in.)	29.0
Diameters Upstream from Flow Disturbance (* 0.5 De)	0.61
Minimum Traverse Points Needed for a Velocity Traverse *	16
Minimum Traverse Points Needed for a Particulate Traverse *	24

Distance Downstream from Flow Disturbance (in.)	128.0
Diameters Downstream from Flow Disturbance (* 2 De)	2.69
Minimum Traverse Points Needed for a Velocity Traverse *	16
Minimum Traverse Points Needed for a Particulate Traverse *	24

Minimum Traverse Points	24
Traverse Point Overide	
Duct Area - in^2	1775.79
Duct Area - ft^2	12.3319
Diameter Check via Circumference (in.)	0.0000

Number of Ports:

Direction of Flow:

Isokinetic Sample: Yes / No

Stack Build-up: Yes / No

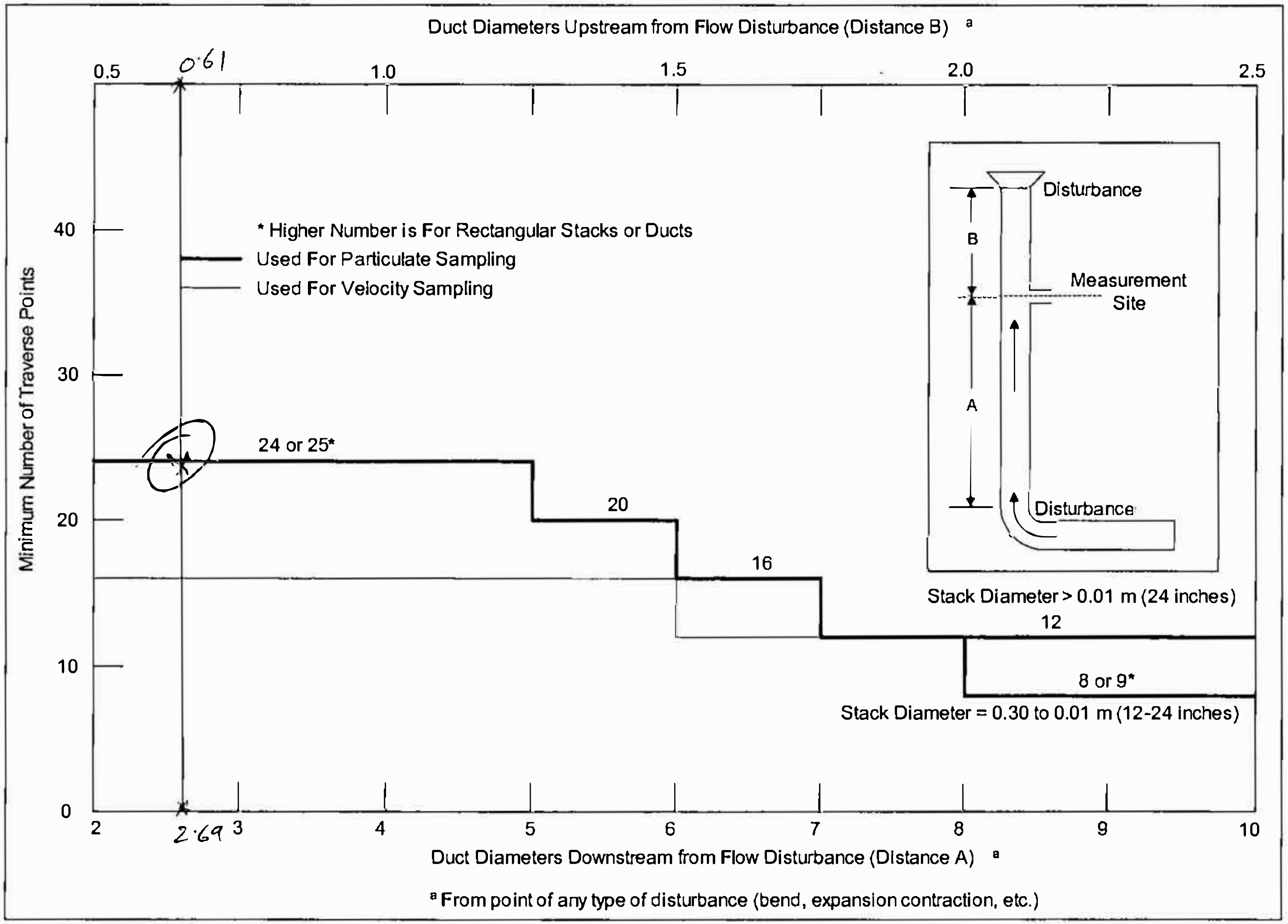
Port	Point	% of Duct Depth	Dist. From Inside Wall (Decimal)	Dist. From Outside Wall (Decimal)
1	1	2.1	1.0	3.1
1	2	6.7	3.2	5.3
1	3	11.8	5.6	7.7
1	4	17.7	8.4	10.5
1	5	25	11.9	14.0
1	6	35.6	16.9	19.0
1	7	64.4	30.6	32.7
1	8	75	35.6	37.7
1	9	82.3	39.1	41.2
1	10	88.2	41.9	44.0
1	11	93.3	44.3	46.4
1	12	97.9	46.5	48.6
2	1	2.1	1.0	3.1
2	2	6.7	3.2	5.3
2	3	11.8	5.6	7.7
2	4	17.7	8.4	10.5
2	5	25	11.9	14.0
2	6	35.6	16.9	19.0
2	7	64.4	30.7	32.8
2	8	75	35.7	37.8
2	9	82.3	39.2	41.3
2	10	88.2	42.0	44.1
2	11	93.3	44.4	46.5
2	12	97.9	46.6	48.7

Location of Points in Circular Stacks or Ducts

	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.5	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9

Location of Points in Rectangular Stacks or Ducts

Method 1 Criteria Data



Test Location P002 Exhaust Stack (B)

Job Number: 070920 B
Done By / Date: IG / 9/26/07
Checked By / Date: PV / 10/22/07
Final Check By / Date: [illegible]

Method 4 Pre-Test Orifice Meter Check

______ Operate the Dry Gas Meter at the ΔH@ pressure differential for 10 minutes.
The ΔH@ number is taken from the Meter Console Calibration Sheet or the tag.

______ Record the Dry Gas Meter Volume (CF), Meter Temperatures (°R = 460 + °F) and Barometric Pressure (in.Hg).

Meter ID T-MTB-013 Calibration Date: 8. 3.07

Dry Gas Meter Volume 724.000 (V_{mi}) Start 731.575 (V_{mf}) End

Barometric Pressure 29.13 (inHg)

ΔH@ = 1.808

γ = 0.9957

$V_m = V_{mf} - V_{mi}$ = 7.575

Time (min)	Meter In (°F)	Meter Out (°F)
2	—	78
4	—	79
6	—	79
8	—	80
10	—	80
Avg.	—	79.2
Avg. of Avgs.	—	

______ Calculate the Dry Gas Meter Calibration Value (γ_c)

Formula $\gamma_c = (10 / Vm) * [0.0319 (Tm/Pbar)]^{1/2}$

Calculate $\gamma_c = (10/ \ 7.575 \ ) \times [0.0319 (\ 79.2+460)/ \ 29.13 \ ]^{1/2}$

______ Compare the γ_c value with the Dry Gas Meter Calibration Factor γ to determine if:

$0.97(\gamma) < \gamma_c < 1.03(\gamma)$

Calculate 0.97 (.9957) < γ_c < 1.03 (.9957)

0.9658 < 1.01442 < 1.0256

______ If the γ_c is not within this range, the Dry Gas Meter should be investigated before beginning the test.

Pass

Job Number: 070920 B
Done By / Date: JG / 9.26.07
Checked By / Date: PJ / 10/12/07
Final Check By / Date: [illegible] / 10-2-07

__________ Operate the Dry Gas Meter at the ΔH@ pressure differential for 10 minutes.
The ΔH@ number is taken from the Meter Console Calibration Sheet or the tag.

__________ Record the Dry Gas Meter Volume (CF), Meter Temperatures (°R = 460 + °F) and Barometric Pressure (in.Hg).

Meter Box No.	T-MTB-013	Initial Dry Gas Meter Volume	724.000
Calibration Date	3-Aug -07	Final Dry Gas Meter Volume	731.575
		Net Dry Gas Meter Volume	7.575
ΔH@ =	1.808		
γ =	0.9957	Barometric Pressure (inHg)	29.13

Time (min)	Meter In (°F)	Meter Out (°F)
2	78	78
4	79	79
6	79	79
8	80	80
10	80	80
Avg.	79.2	79.2
Avg. of Avgs.	79.2	

__________ Calculate the Dry Gas Meter Calibration Value (γ_c)

$$\gamma_c = (10 / Vm) * [0.0319 (Tm/Pbar]^{1/2}$$

__________ Compare the γ_c value with the Dry Gas Meter Calibration Factor γ to determine if:

$$0.97(\gamma) < \gamma_c < 1.03(\gamma)$$

Calculate

0.9658	<	1.0144	<	1.0256	PASS

__________ If the γ_c is not within this range, the Dry Gas Meter should be investigated before beginning the test.

Method 4 Pre-Test Orifice Meter Check

✓ Operate the Dry Gas Meter at the ΔH@ pressure differential for 10 minutes.

✓ The ΔH@ number is taken from the Meter Console Calibration Sheet or the tag. Record the Dry Gas Meter Volume (CF), Meter Temperatures (°R = 460 + °F) and Barometric Pressure (in.Hg).

Meter ID T-MTB-011 Calibration Date: 8/3/07

Dry Gas Meter Volume 411.000 (V_{mi}) Start 418.442 (V_{mf}) End

Barometric Pressure 29.13 (inHg)

ΔH@ = 1.822

γ = 1.0154

$V_m = V_{mf} - V_{mi}$ = 7.442

Time (min)	Meter In (°F)	Meter Out (°F)
2	89	82
4	90	82
6	91	82
8	91	82
10	91	82
Avg.	90.4	82
Avg. of Avgs.	86.2	

✓ Calculate the Dry Gas Meter Calibration Value (γ_c)

Formula $\gamma_c = (10 / Vm) * [0.0319 (Tm/Pbar)]^{1/2}$

Calculate $\gamma_c = (10/ 7.442) \times [0.0319 (86.2+460)/ 29.13]^{1/2}$

✓ Compare the γ_c value with the Dry Gas Meter Calibration Factor γ to determine if:

$0.97(\gamma) < \gamma_c < 1.03(\gamma)$

Calculate 0.97 (1.0154) < 1.0392 < 1.03 (1.0154)

0.9849 < 1.0392 < 1.0459

✓ If the γ_c is not within this range, the Dry Gas Meter should be investigated before beginning the test.

pass

Job Number: 070920-A
Done By / Date: KC / 9/26/07
Checked By / Date: PU / 10/22/07
Final Check By / Date: [illegible] / 10-23-07

Operate the Dry Gas Meter at the ΔH@ pressure differential for 10 minutes.
The ΔH@ number is taken from the Meter Console Calibration Sheet or the tag.

Record the Dry Gas Meter Volume (CF), Meter Temperatures (°R = 460 + °F) and Barometric Pressure (in.Hg).

Meter Box No.	**T-MTB-011**
Calibration Date	**8/3/2007**
ΔH@ =	**1.822**
γ =	**1.0154**

Initial Dry Gas Meter Volume	**411.000**
Final Dry Gas Meter Volume	**418.442**
Net Dry Gas Meter Volume	**7.442**
Barometric Pressure (inHg)	**29.13**

Time (min)	Meter In (°F)	Meter Out (°F)
2	**89**	**82**
4	**90**	**82**
6	**91**	**82**
8	**91**	**82**
10	**91**	**82**
Avg.	90.4	82
Avg. of Avgs.	**86.2**	

Calculate the Dry Gas Meter Calibration Value (γ_c)

$$\gamma_c = (10 / Vm) * [0.0319 (Tm/Pbar]^{1/2}$$

Compare the γ_c value with the Dry Gas Meter Calibration Factor γ to determine if:

$$0.97(\gamma) < \gamma_c < 1.03(\gamma)$$

Calculate

0.9849	<	**1.0392**	<	1.0459	PASS

If the γ_c is not within this range, the Dry Gas Meter should be investigated before beginning the test.

Method 306 Probe Nozzle Inspection

The sampling nozzle must be calibrated before use in a source experiment. Calibration should be done in the laboratory and checked just before use in the field. Inside / outside calipers are used to measure the interior nozzle diameter to the nearest 0.025mm (0.001 inch).

The calipers are inserted as close to the edge of the nozzle opening as possible; readings are taken on three separate diameters and recorded. The average of the three readings will be the Assigned Nozzle Size. Each reading must agree within 0.1 mm (0.004 inch), or the nozzle must be reshaped. Any nozzle that has been nicked, dented, or corroded must be reshaped and recalibrated. All calibrated nozzles should be permanently identified.

Run # 1, 3
Nozzle ID # D-2

Measured Nozzle Size (inches)	Assigned Nozzle Size (inches)	Difference Between High and Low Measurements	
0.213			
0.213	0.213	0.000	<= 0.004in
0.213			

Run # 2
Nozzle ID # D-6

Measured Nozzle Size (inches)	Assigned Nozzle Size (inches)	Difference Between High and Low Measurements	
0.212			
0.212	0.212	0.001	<= 0.004in
0.213			

Run #
Nozzle ID #

Measured Nozzle Size (inches)	Assigned Nozzle Size (inches)	Difference Between High and Low Measurements	
			<= 0.004in

Job Number: 070920 B

Air Compliance Testing, Inc.

Done By / Date: AS / 9-26-07

(Method 306.xls-Probe Nozzle Inspection) 9/13/2007

Final Check By / Date: DU / 10/24/07

Method 306 Probe Nozzle Inspection

The sampling nozzle must be calibrated before use in a source experiment. Calibration should be done in the laboratory and checked just before use in the field. Inside / outside calipers are used to measure the interior nozzle diameter to the nearest 0.025mm (0.001 inch).

The calipers are inserted as close to the edge of the nozzle opening as possible; readings are taken on three separate diameters and recorded. The average of the three readings will be the Assigned Nozzle Size. Each reading must agree within 0.1 mm (0.004 inch), or the nozzle must be reshaped. Any nozzle that has been nicked, dented, or corroded must be reshaped and recalibrated. All calibrated nozzles should be permanently identified.

Run # ~~1, 3~~ 2 A3
Nozzle ID # D-9

Measured Nozzle Size (inches)	Assigned Nozzle Size (inches)	Difference Between High and Low Measurements	
0.221			
0.221	0.221	0.001	<= 0.004in
0.220			

Run # 1, 3 A3 A3
Nozzle ID # .225

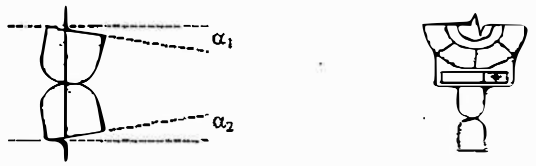
Measured Nozzle Size (inches)	Assigned Nozzle Size (inches)	Difference Between High and Low Measurements	
0.217			
0.217	0.217	0.001	<= 0.004in
0.218			

Run #
Nozzle ID #

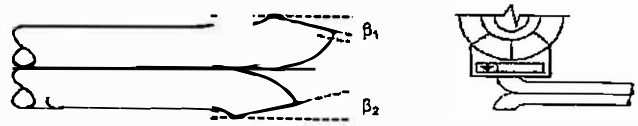
Measured Nozzle Size (inches)	Assigned Nozzle Size (inches)	Difference Between High and Low Measurements	
			<= 0.004in

Job Number: 070920 A
Done By / Date: AS / 9/27/07
Final Check By / Date: PU / 10/22/07

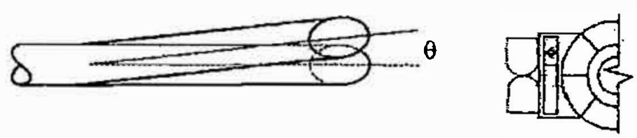
Pitot Tube Inspection



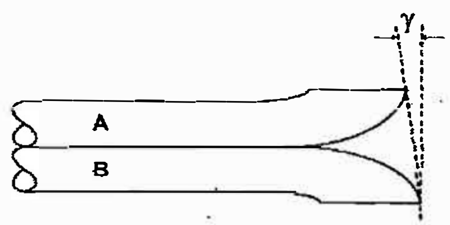
Degree indicating level position for determining α_1 and α_2.



Degree indicating level position for determining β_1 and β_2.

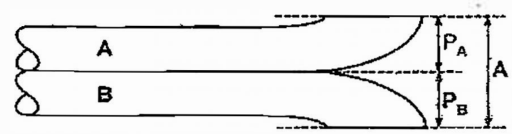


Degree indicating level position for determining θ.

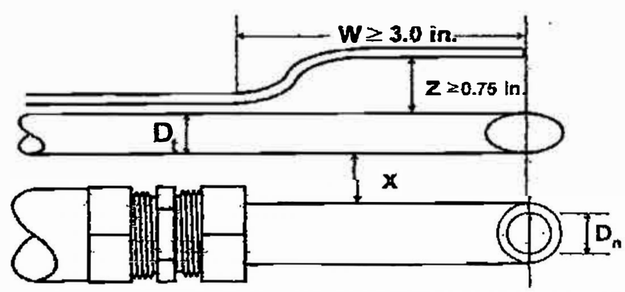


Degree indicating level position for determining γ then calculating Z.

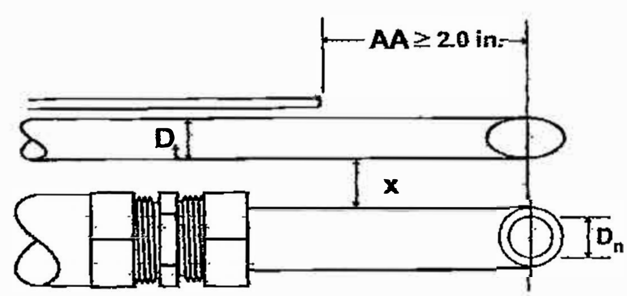
Probe / Pitot Number	T-PRB-610
Level and Perpendicular?	Yes / No
Obstructions?	Yes / No
Damaged?	Yes / No
α_1 $(-10° < \alpha_1 < +10°)$	-3°
α_2 $(-10° < \alpha_2 < +10°)$	2°
β_1 $(-5° < \beta_1 < +5°)$	1°
β_2 $(-5° < \beta_2 < +5°)$	2°
γ	0
θ	0
A	.97
z= A tan γ (< 0.125")	~~.48~~ 0
w= A tan θ (< 0.03125")	~~.48~~ 0
D_t (0.1875" < D_t < 0.375")	.370
P_A $(1.05D_t < P_A < 1.5D_t)$	48
P_B $(1.05D_t < P_B < 1.5D_t)$	.48
$P_A = P_B$	Yes / No

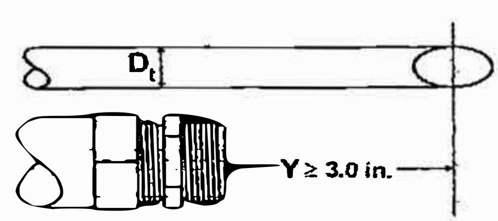


Probe Minimum Interferences



Effective Length (in.)	62"
W (≥ 3.0")	7.5"
~~or AA (≥ 2.0")~~	
X	1.5
D_n	.497
X / D_n (≥ 1.5)	3.02
Y (≥ 3.0")	3.7
Z ≥ 0.75"	1.6"

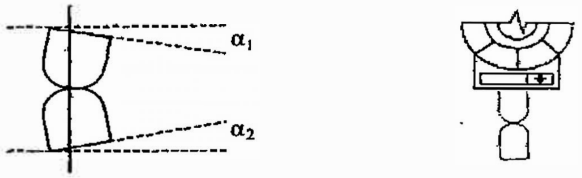




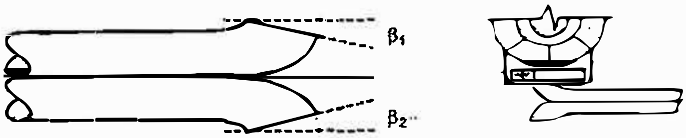
Job Number: 070920
Done By / Date: ES / 9-26-07

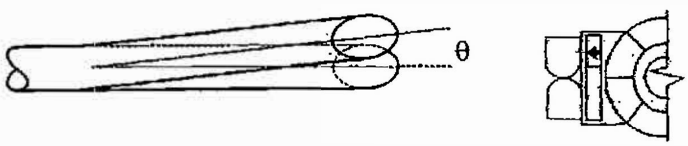
Type S Pitot Tube Inspection

Alignment and Tubing Dimensions

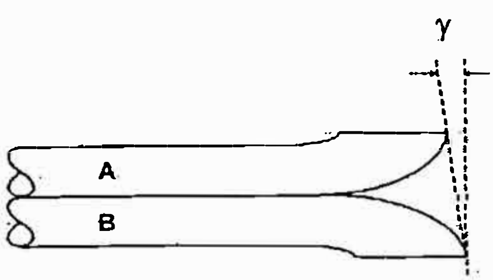


Degree indicating level position for determining α_1 and α_2.



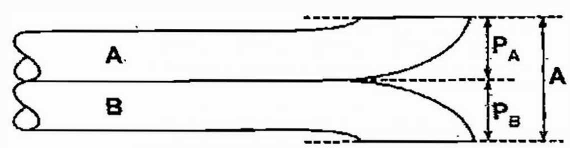


Degree indicating level position for determining θ.

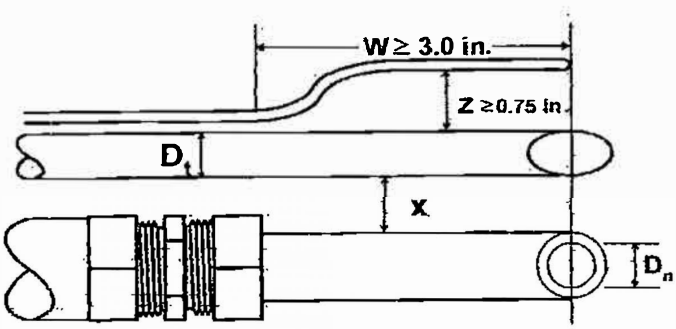


Degree indicating level position for determining γ then calculating Z.

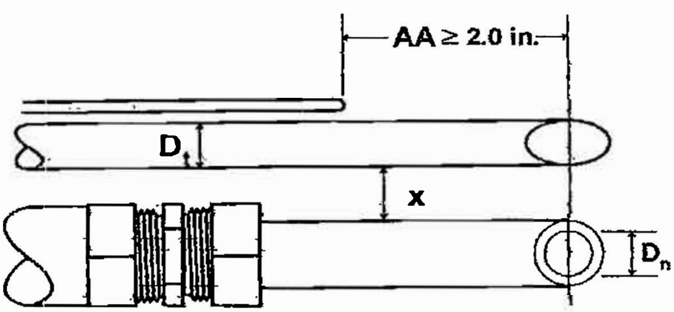
Probe / Pitot Number	PRB-610
Level and Perpendicular	Yes / No
Obstructions	Yes / No
Damaged	Yes / No
α_1 $(-10° < \alpha_1 < +10°)$	-1°
α_2 $(-10° < \alpha_2 < +10°)$	-2°
β_1 $(-5° < \beta_1 < +5°)$	-1°
β_2 $(-5° < \beta_2 < +5°)$	2°
γ	3°
θ	~~3°~~ 0° SD
A	.950
$z = A \tan\gamma$ $(< 0.125")$	.050"
$w = A \tan\theta$. $(< 0.03125")$	~~.050"~~ 0" SD
D_t $(0.1875" < D_t < 0.375")$	.375"
P_A $(1.05D_t < P_A < 1.5D_t)$	.470"
P_B $(1.05D_t < P_B < 1.5D_t)$	.480"
$P_A = P_B \pm 0.0625$	Yes / No

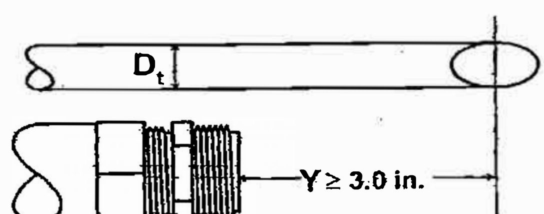


Assembly Inter-Component Spacing Requirements



Effective Length (in.)	61"
W (≥ 3.0")	6.7"
-or- AA (≥ 2.0")	—
X	.907
D_n	.497"
X / D_n (≥ 1.5)	1.82
Y (≥ 3.0")	3.6"
Z ≥ 0.75"	1.51"

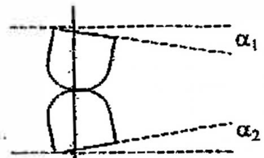


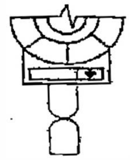


Job Number: 070920 A
Done By / Date: SD 1-9/28

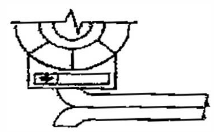
Type S Pitot Tube Inspection

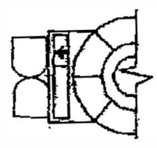
Alignment and Tubing Dimensions



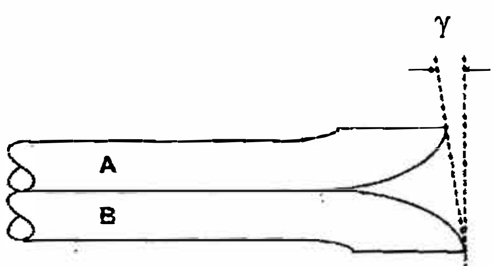


Degree indicating level position for determining α_1 and α_2.



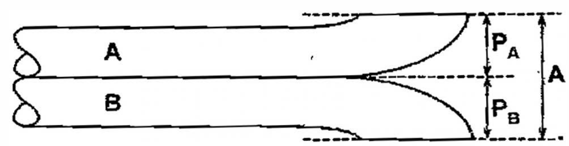


Degree indicating level position for determining θ.

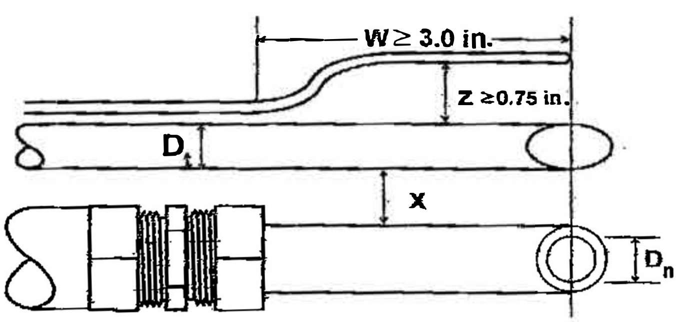


Degree indicating level position for determining γ then calculating Z.

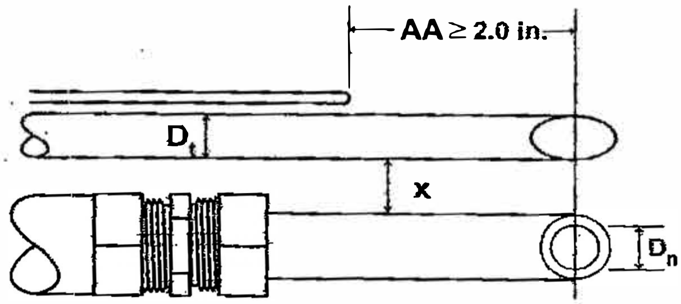
Probe / Pitot Number	PRB602
Level and Perpendicular	Yes / No
Obstructions	Yes / No
Damaged	Yes / No
α_1 $(-10° < \alpha_1 < +10°)$	2
α_2 $(-10° < \alpha_2 < +10°)$	2
β_1 $(-5° < \beta_1 < +5°)$	2
β_2 $(-5° < \beta_2 < +5°)$	2
γ	-3
θ	0
A	.862
z= A tan γ (< 0.125")	-.004
w= A tan θ (< 0.03125")	0
D_t (0.1875" < D_t < 0.375")	.375
P_A ($1.05D_t$ < P_A < $1.5D_t$)	.431
P_B ($1.05D_t$ < P_B < $1.5D_t$)	.431
$P_A = P_B \pm 0.0625$	Yes / No

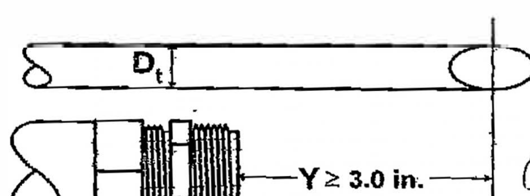


Assembly Inter-Component Spacing Requirements



Effective Length (in.)	63"
W (≥ 3.0")	6.6
-or- AA (≥ 2.0")	—
X	.85
D_n	.497
X / D_n (≥ 1.5)	17
Y (≥ 3.0")	3.2
Z ≥ 0.75"	.90





070813C

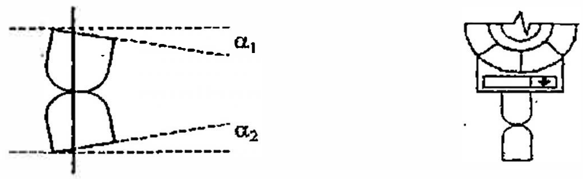
Job Number: 061208B

Done By / Date: [initials] / 8-8-07

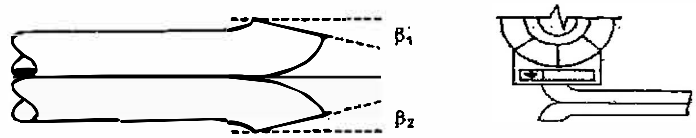
Air Compliance Testing, Inc. (Method 2.xls)

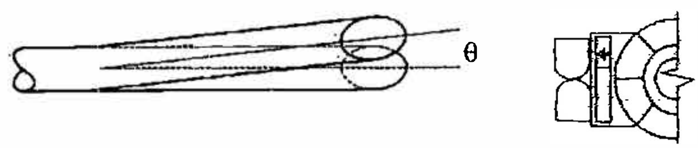
Type S Pitot Tube Inspection

Alignment and Tubing Dimensions

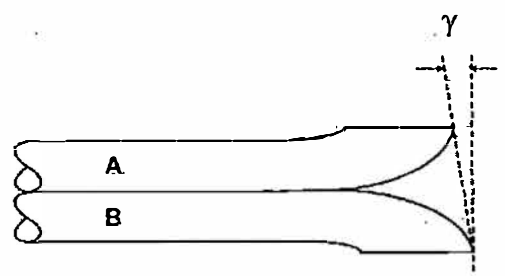


Degree indicating level position for determining α_1 and α_2.



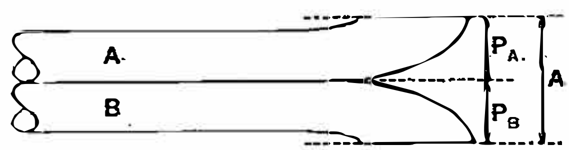


Degree indicating level position for determining θ.

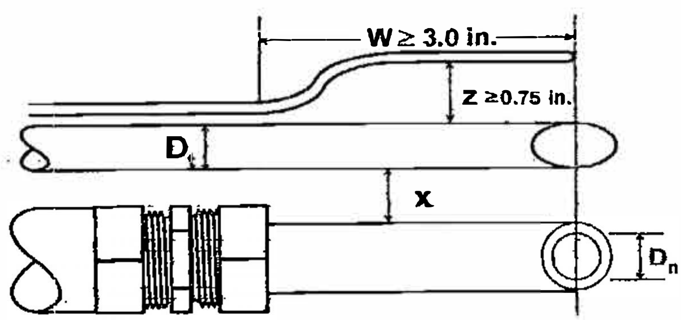


Degree indicating level position for determining γ then calculating Z.

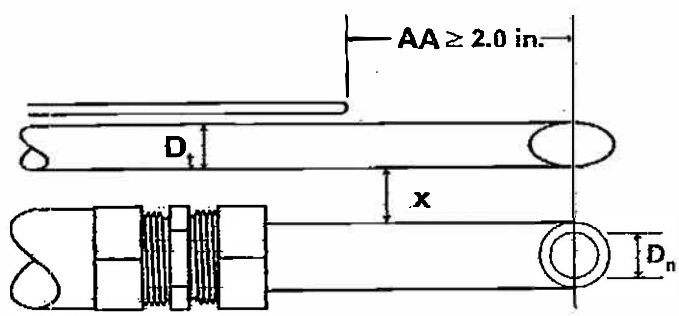
Probe / Pitot Number	T-PRB-602
Level and Perpendicular	Yes / No
Obstructions	Yes / No
Damaged	Yes / No
α_1 $(-10° < \alpha_1 < +10°)$	0°
α_2 $(-10° < \alpha_2 < +10°)$	2°
β_1 $(-5° < \beta_1 < +5°)$	1°
β_2 $(-5° < \beta_2 < +5°)$	1°
γ	0°
θ	0°
A	.878"
z= A tan γ (< 0.125")	0"
w= A tan θ (< 0.03125")	0"
D_t (0.1875" < D_t < 0.375")	.375
P_A (1.05D_t < P_A < 1.5D_t)	.434"
P_B (1.05D_t < P_B < 1.5D_t)	.444"
$P_A = P_B \pm 0.0625$	Yes / No

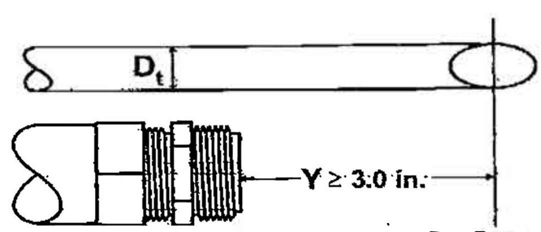


Assembly Inter-Component Spacing Requirements



Effective Length (in.)	61"
W (≥ 3.0")	6"
-or- AA (≥ 2.0")	—
X	.874"
D_n	.495"
X / D_n (≥ 1.5)	1.77
Y (≥ 3.0")	3.6"
Z ≥ 0.75"	.879"



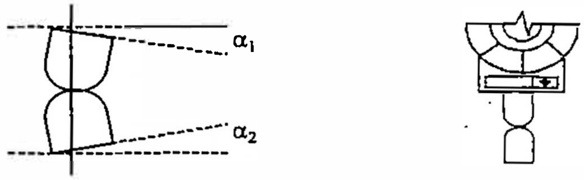


Job Number: 0709203

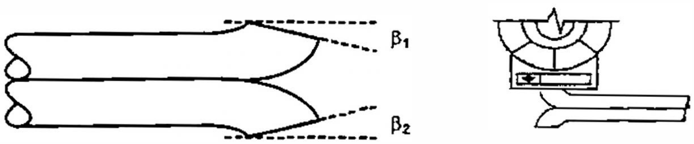
Done By / Date: GB / 9/28

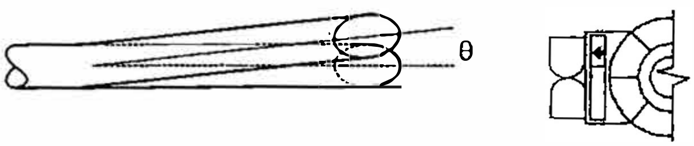
Type S Pitot Tube Inspection

Alignment and Tubing Dimensions

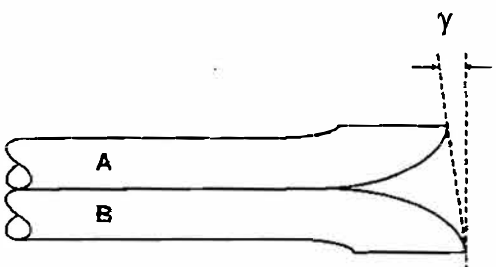


Degree indicating level position for determining α_1 and α_2.



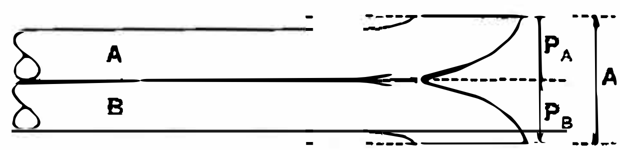


Degree indicating level position for determining θ.

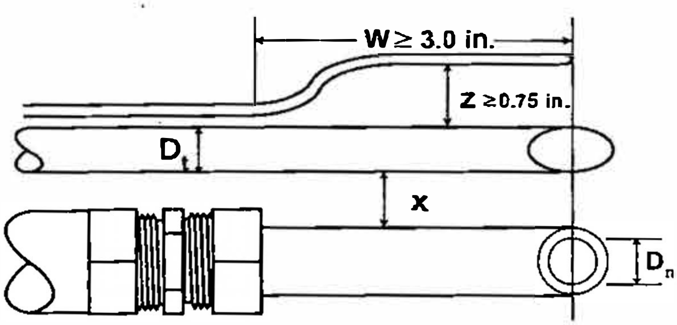


Degree indicating level position for determining γ then calculating Z.

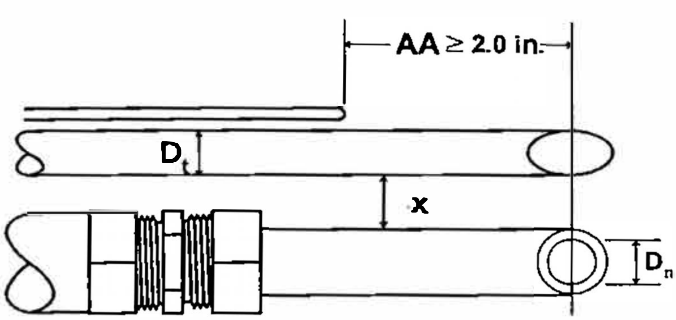
Probe / Pitot Number	T-PRB-603
Level and Perpendicular	Yes / No
Obstructions	Yes / No
Damaged	Yes / No
α_1 $(-10° < \alpha_1 < +10°)$	-1
α_2 $(-10° < \alpha_2 < +10°)$	-1
β_1 $(-5° < \beta_1 < +5°)$	0
β_2 $(-5° < \beta_2 < +5°)$	0
γ	0
θ	0
A	.923
z= A tan γ (< 0.125")	0
w= A tan θ (< 0.03125")	0
D_t (0.1875" < D_t < 0.375")	.374
P_A (1.05D_t < P_A < 1.5D_t)	.462
P_B (1.05D_t < P_B < 1.5D_t)	.461
$P_A = P_B \pm 0.0625$	Yes / No

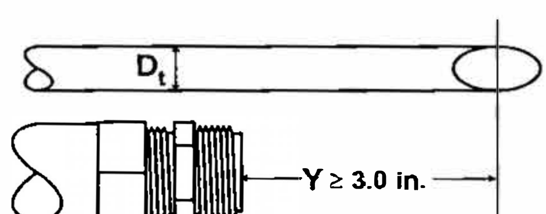


Assembly Inter-Component Spacing Requirements



Effective Length (in.)	63.0
W (≥ 3.0")	6.8
-or- AA (≥ 2.0")	←
X	1.2
D_n	.497
X / D_n (≥ 1.5)	2.4
Y (≥ 3.0")	4.0
Z ≥ 0.75"	1.3

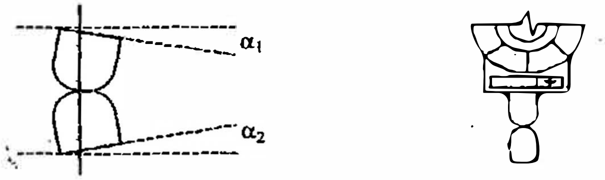




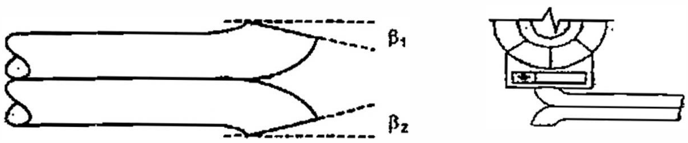
Job Number: 070808B
Done By / Date: KG 1 9/10/07

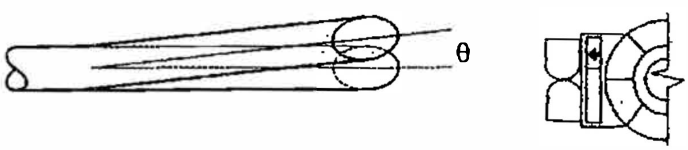
Type S Pitot Tube Inspection

Alignment and Tubing Dimensions



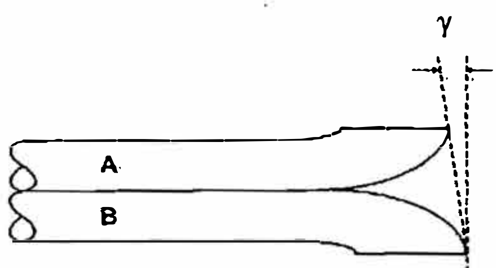
Degree indicating level position for determining α_1 and α_2.





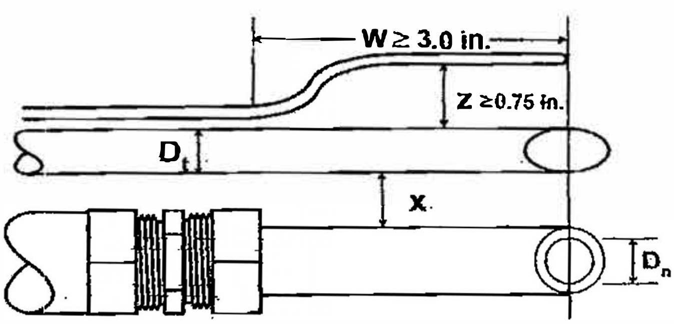
Degree indicating level position for determining θ.

Probe / Pitot Number	T-PRB-603
Level and Perpendicular	Yes / No
Obstructions	Yes / No
Damaged	Yes / No
α_1 $(-10° < \alpha_1 < +10°)$	1°
α_2 $(-10° < \alpha_2 < +10°)$	0°
β_1 $(-5° < \beta_1 < +5°)$	0°
β_2 $(-5° < \beta_2 < +5°)$	1°
γ	0°
θ	1°
A	.932"
$z = A \tan\gamma$ (< 0.125")	0"
$w = A \tan\theta$ (< 0.03125")	.016"
D_t (0.1875" < D_t < 0.375")	.375"
P_A $(1.05D_t < P_A < 1.5D_t)$	.431"
P_B $(1.05D_t < P_B < 1.5D_t)$	.501"
$P_A = P_B \pm 0.0625$	Yes / No

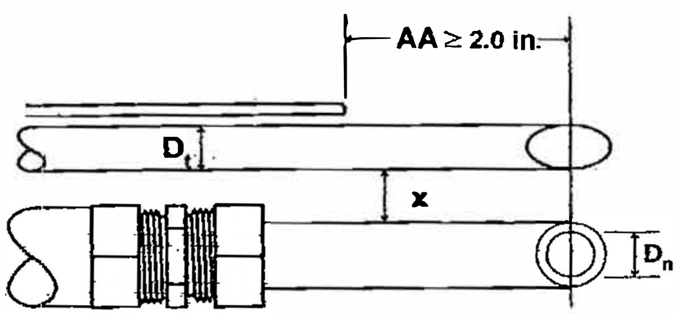


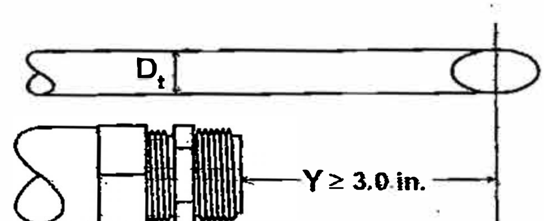
Degree indicating level position for determining γ then calculating Z.

Assembly Inter-Component Spacing Requirements



Effective Length (in.)	60"
W (≥ 3.0")	6"
-or- AA (≥ 2.0")	-
X	1.06"
D_n	.490"
X / D_n (≥ 1.5)	2.16
Y (≥ 3.0")	4.0"
Z ≥ 0.75"	1.461"



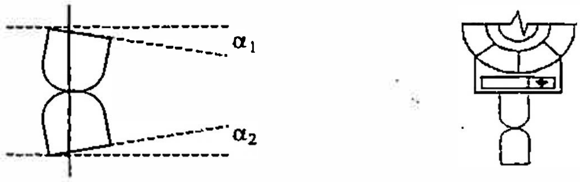


Job Number: 070920B
Done By / Date: JD / 9/28

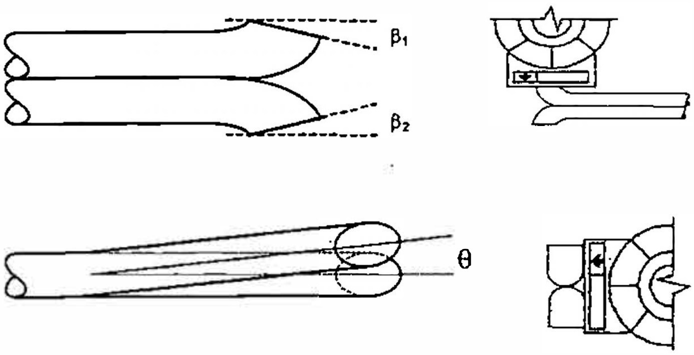
Air Compliance Testing, Inc. (Method 2.xls)

Type S Pitot Tube Inspection

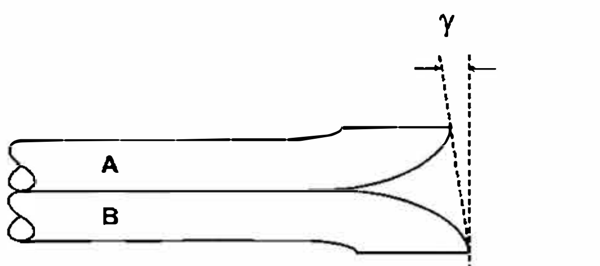
Alignment and Tubing Dimensions



Degree indicating level position for determining α_1 and α_2.

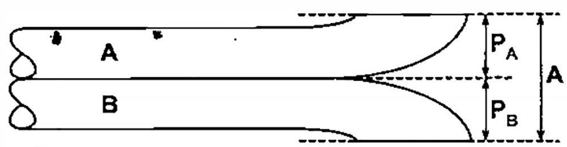


Degree indicating level position for determining θ.

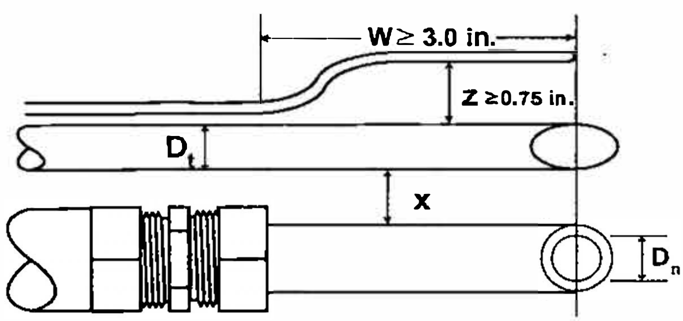


Degree indicating level position for determining γ then calculating Z.

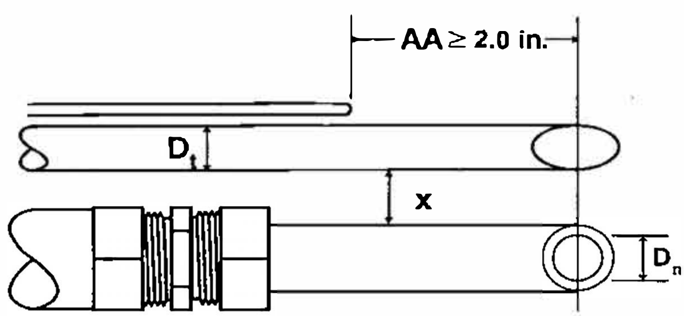
Probe / Pitot Number	PIT-601
Level and Perpendicular	Yes / No
Obstructions	Yes / No
Damaged	Yes / No
α_1 $(-10° < \alpha_1 < +10°)$	1°
α_2 $(-10° < \alpha_2 < +10°)$	1°
β_1 $(-5° < \beta_1 < +5°)$	0°
β_2 $(-5° < \beta_2 < +5°)$	0°
γ	-1°
θ	0°
A	.975"
z= A tan γ (< 0.125")	-.017"
w= A tan θ (< 0.03125")	0"
D_t (0.1875" < D_t < 0.375")	.372"
P_A $(1.05D_t < P_A < 1.5D_t)$	.461"
P_B $(1.05D_t < P_B < 1.5D_t)$	.514"
$P_A = P_B \pm 0.0625$	Yes / ~~No~~

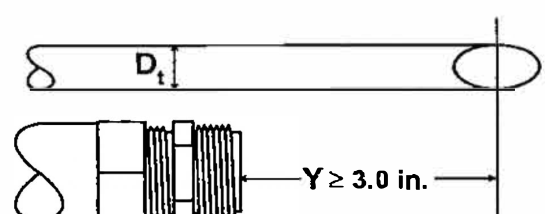


Assembly Inter-Component Spacing Requirements



Effective Length (in.)	73"
W (≥ 3.0")	3.32"
-or- AA (≥ 2.0")	–
X	–
D_n	–
X / D_n (≥ 1.5)	–
Y (≥ 3.0")	–
Z ≥ 0.75"	.756"



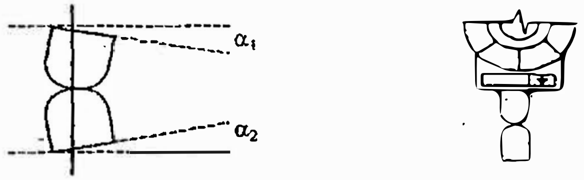


Job Number: 070802

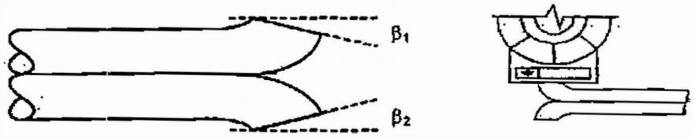
Done By / Date: JO / 8/24/07

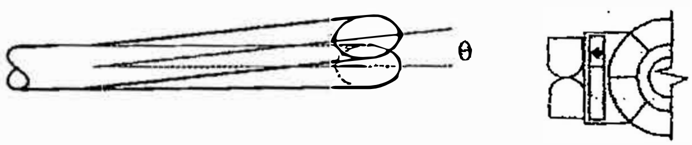
Type S Pitot Tube Inspection

Alignment and Tubing Dimensions



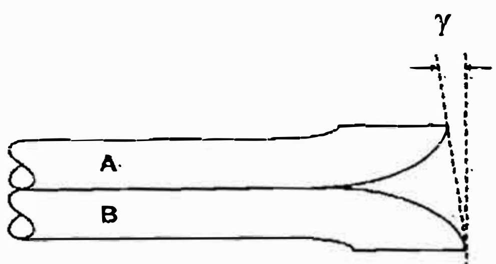
Degree indicating level position for determining α_1 and α_2.

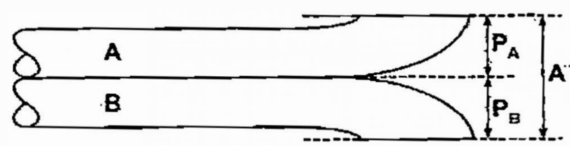




Degree indicating level position for determining θ.

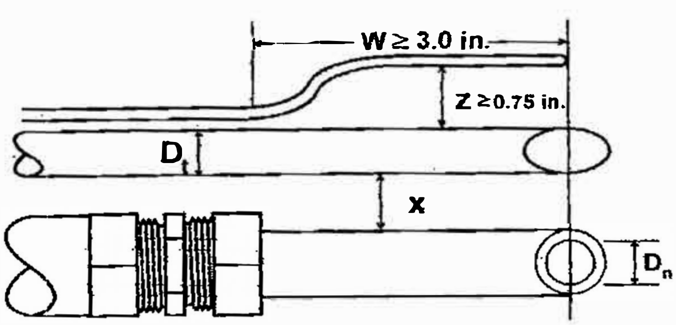
Probe / Pitot Number	T - PTT-601
Level and Perpendicular	Yes / No
Obstructions	Yes / No
Damaged	Yes / No
α_1 $(-10° < \alpha_1 < +10°)$	-1°
α_2 $(-10° < \alpha_2 < +10°)$	0°
β_1 $(-5° < \beta_1 < +5°)$	1°
β_2 $(-5° < \beta_2 < +5°)$	0°
γ	0°
θ	-2°
A	.789
z= A tan γ (< 0.125")	0"
w= A tan θ. (< 0.03125")	-.035"
D_t (0.1875" < D_t < 0.375")	.375"
P_A $(1.05D_t < P_A < 1.5D_t)$	.481
P_B $(1.05D_t < P_B < 1.5D_t)$	.508
$P_A = P_B \pm 0.0625$	Yes / No



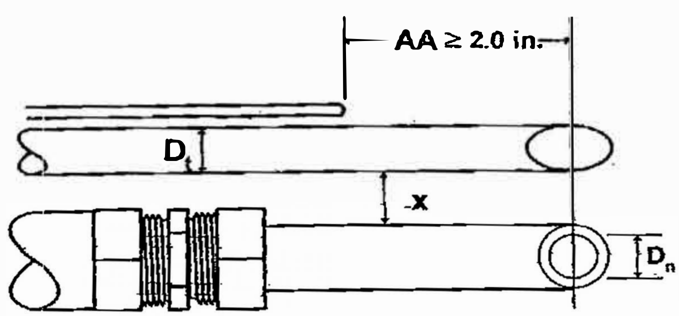


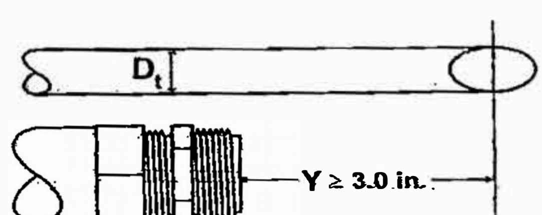
Degree indicating level position for determining γ then calculating Z.

Assembly Inter-Component Spacing Requirements



Effective Length (in.)	71"
W (≥ 3.0")	3.0"
-or- AA (≥ 2.0")	—
X	—
D_n	—
X / D_n (≥ 1.5)	—
Y (≥ 3.0")	—
Z ≥ 0.75"	.75"

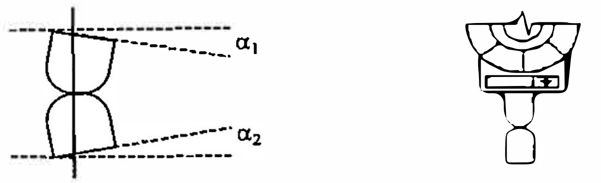




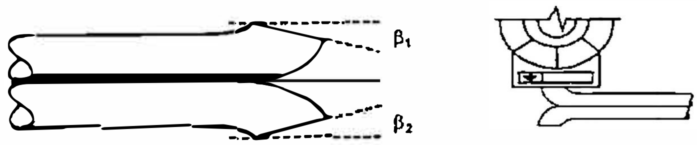
Job Number: 070920B
Done By / Date: JB 1.9/28

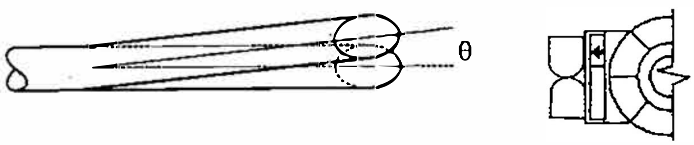
Type S Pitot Tube Inspection

Alignment and Tubing Dimensions

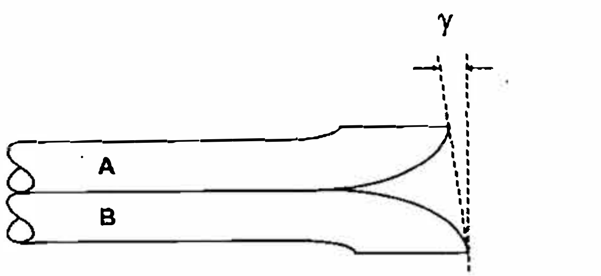


Degree indicating level position for determining α_1 and α_2.



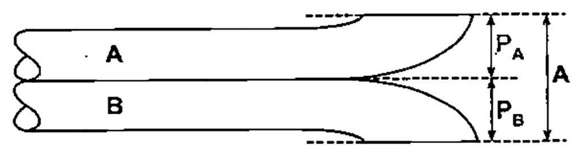


Degree indicating level position for determining θ.

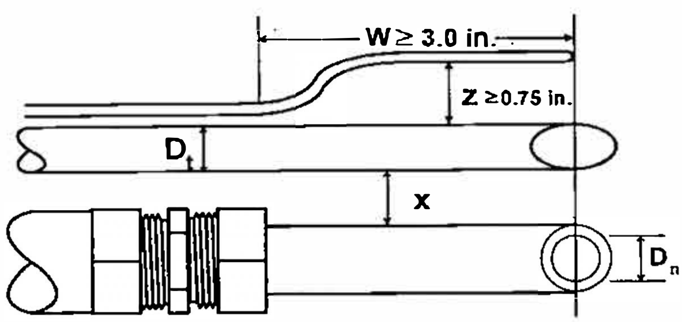


Degree indicating level position for determining γ then calculating Z.

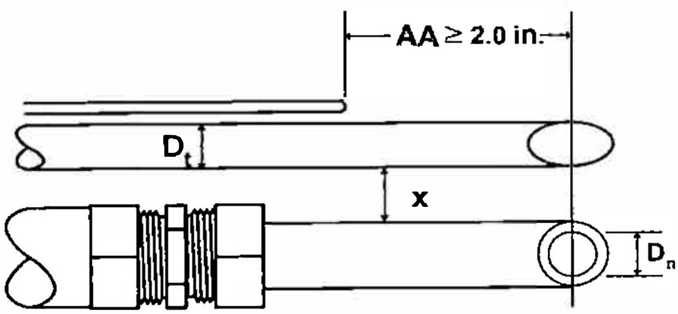
Probe / Pitot Number	T-PIT-161
Level and Perpendicular	Yes / No (Yes circled)
Obstructions	Yes / No (No circled)
Damaged	Yes / No (No circled)
α_1 $(-10° < \alpha_1 < +10°)$	0
α_2 $(-10° < \alpha_2 < +10°)$	1
β_1 $(-5° < \beta_1 < +5°)$	-1
β_2 $(-5° < \beta_2 < +5°)$	-4
γ	0
θ	0
A	.951
z= A tan γ (< 0.125")	0
w= A tan θ (< 0.03125")	0
D_t (0.1875" < D_t < 0.375")	.374
P_A $(1.05D_t < P_A < 1.5D_t)$	.476
P_B $(1.05D_t < P_B < 1.5D_t)$	.478
$P_A = P_B \pm 0.0625$	Yes / No (Yes circled)

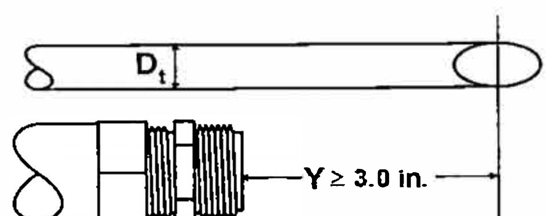


Assembly Inter-Component Spacing Requirements



Effective Length (in.)	73.2
W (≥ 3.0")	—
-or- AA (≥ 2.0")	2.2
X	—
D_n	—
X / D_n (≥ 1.5)	—
Y (≥ 3.0")	—
Z ≥ 0.75"	—

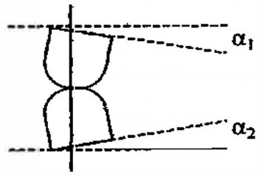


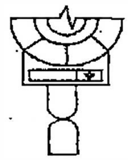


Job Number: 070812A
Done By / Date: KC 8/24/07

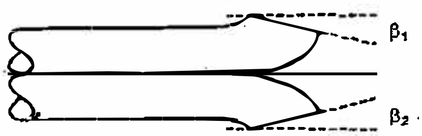
Type S Pitot Tube Inspection

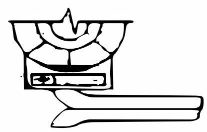
Alignment and Tubing Dimensions

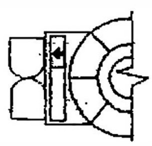




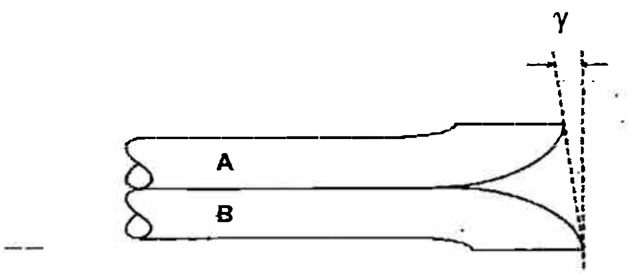
Degree indicating level position for determining α_1 and α_2.







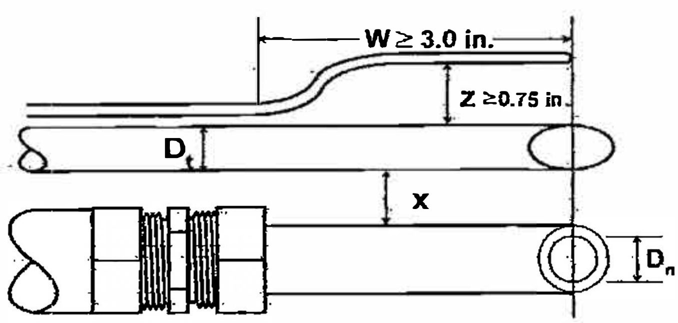
Degree indicating level position for determining θ.



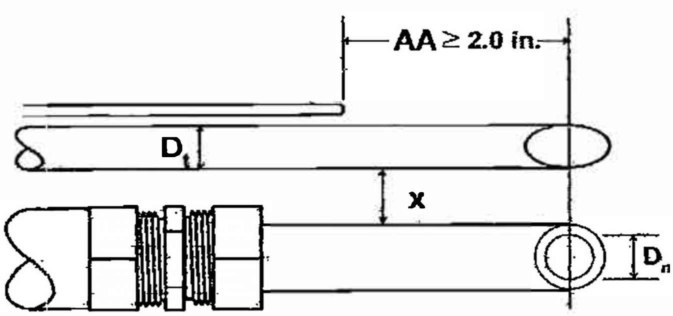
Degree indicating level position for determining γ then calculating Z.

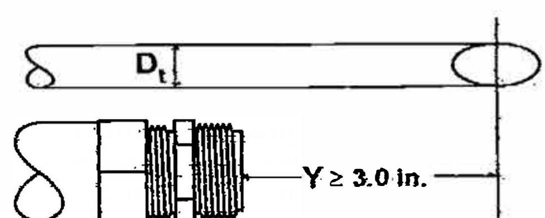
Probe / Pitot Number	PIT-I61
Level and Perpendicular	Yes / No
Obstructions	Yes / No
Damaged	Yes / No
α_1 $(-10° < \alpha_1 < +10°)$	-2°
α_2 $(-10° < \alpha_2 < +10°)$	-1°
β_1 $(-5° < \beta_1 < +5°)$	-2°
β_2 $(-5° < \beta_2 < +5°)$	0°
γ	1°
θ	4°
A	.993
z= A tan γ (< 0.125")	.017"
w= A tan θ (< 0.03125")	.069"
D_t (0.1875" < D_t < 0.375")	.375
P_A $(1.05D_t < P_A < 1.5D_t)$	.479
P_B $(1.05D_t < P_B < 1.5D_t)$	.514
$P_A = P_B \pm 0.0625$	Yes / No

Assembly Inter-Component Spacing Requirements



Effective Length (in.)	69"
W (≥ 3.0")	—
-or- AA (≥ 2.0")	2.1"
X	—
D_n	—
X / D_n (≥ 1.5)	—
Y (≥ 3.0")	—
Z ≥ 0.75"	—

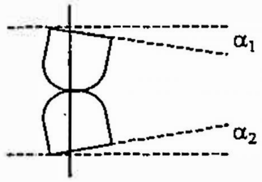


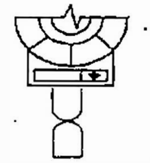


Job Number: 070920A
Done By / Date: JD 1/9/28

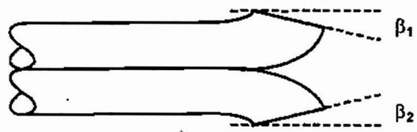
Type S Pitot Tube Inspection

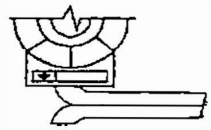
Alignment and Tubing Dimensions

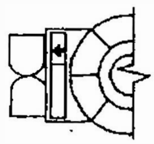




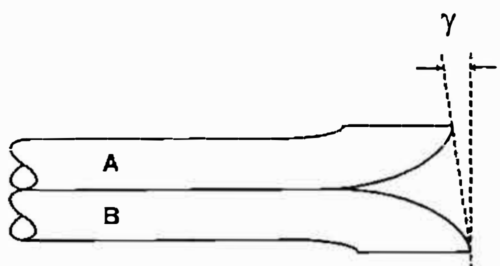
Degree indicating level position for determining α_1 and α_2.





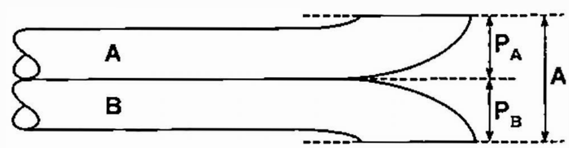


Degree indicating level position for determining θ.

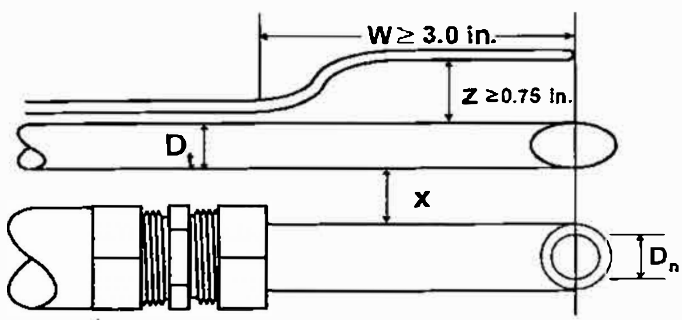


Degree indicating level position for determining γ then calculating Z.

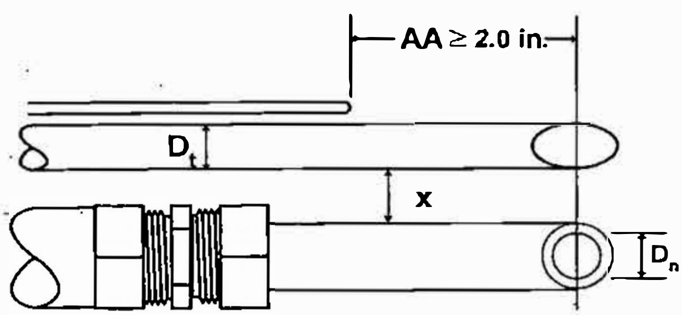
Probe / Pitot Number	PRP-608
Level and Perpendicular	Yes / No
Obstructions	Yes / No
Damaged	Yes / No
α_1 $(-10° < \alpha_1 < +10°)$	1
α_2 $(-10° < \alpha_2 < +10°)$	-1
β_1 $(-5° < \beta_1 < +5°)$	0
β_2 $(-5° < \beta_2 < +5°)$	-1
γ	-2
θ	0
A	.884
z= A tan γ (< 0.125")	-.03
w= A tan θ (< 0.03125")	0
D_t (0.1875" < D_t < 0.375")	.375
P_A (1.05D_t < P_A < 1.5D_t)	.442
P_B (1.05D_t < P_B < 1.5D_t)	.442
$P_A = P_B \pm 0.0625$	Yes / No

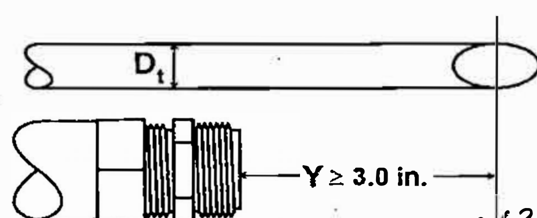


Assembly Inter-Component Spacing Requirements



Effective Length (in.)	62.9"
W (≥ 3.0")	6.9
-or- AA (≥ 2.0")	—
X	1.0
D_n	.497
X / D_n (≥ 1.5)	2.01
Y (≥ 3.0")	3.5
Z ≥ 0.75"	1.4

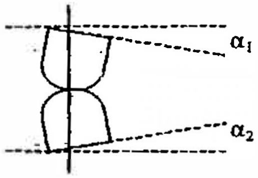


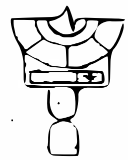


Job Number: 06/208 B
Done By / Date: [illegible] / [illegible]

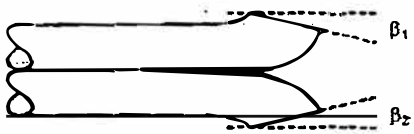
Type S Pitot Tube Inspection

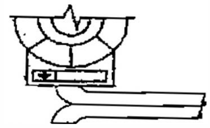
Alignment and Tubing Dimensions

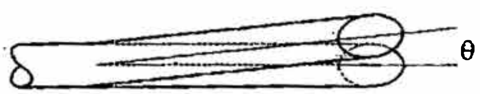


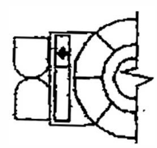


Degree indicating level position for determining α_1 and α_2.

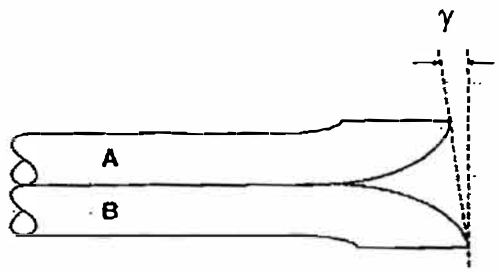






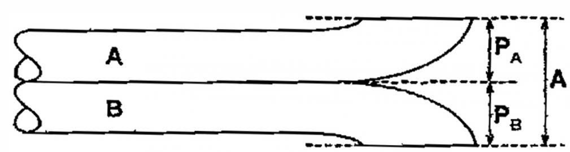


Degree indicating level position for determining θ.

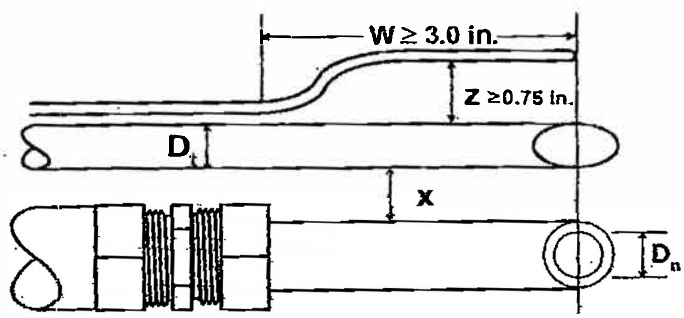


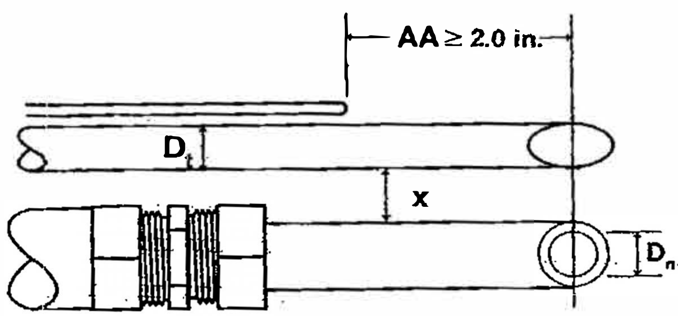
Degree indicating level position for determining γ then calculating Z.

Probe / Pitot Number	PRB-608
Level and Perpendicular	Yes / No (Yes checked)
Obstructions	Yes / No (No circled)
Damaged	Yes / No (No circled)
α_1 $(-10^\circ < \alpha_1 < +10^\circ)$	0°
α_2 $(-10^\circ < \alpha_2 < +10^\circ)$	0°
β_1 $(-5^\circ < \beta_1 < +5^\circ)$	0°
β_2 $(-5^\circ < \beta_2 < +5^\circ)$	0°
γ	1°
θ	0°
A	.888"
z= A tan γ (< 0.125")	.015"
w= A tan θ (< 0.03125")	0"
D_t (0.1875" < D_t < 0.375")	.375"
P_A (1.05D_t < P_A < 1.5D_t)	.445
P_B (1.05D_t < P_B < 1.5D_t)	.443
$P_A = P_B \pm 0.0625$	Yes / No (Yes circled)

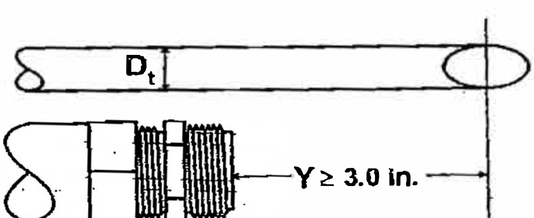


Assembly Inter-Component Spacing Requirements





Effective Length (in.)	61.5
W (≥ 3.0")	6.6"
-or- AA (≥ 2.0")	—
X	1.10"
D_n	.481"
X / D_n (≥ 1.5)	2.29"
Y (≥ 3.0")	3.8"
Z ≥ 0.75"	1.23"



Job Number: 070920A
Done By / Date: JD / 9/28

Method 4 Thermocouple System Audit

Run 1	Probe I.D. - T-PRB-602		Umbilical Adapter I.D. - T-UMA-015	
	Meter Box I.D. - T-MTB-013		Filter Exit I.D. - —	
	Umbilical I.D. - T-UMC-607		Filter Box I.D. - —	

Reference Thermometer °F	Stack	Meter In	Meter Out	Filter Exit	Impinger Exit
78	76	—	78	—	77

Probe Heat Check Start Time:________ Stop Time:________ Target Temperature: 250°F
Filter Box Heat Check Start Time:________ Stop Time:________ Target Temperature: 250°F

Run 2	Probe I.D. - T-PRB-603		Umbilical Adapter I.D. - T-UMA-020	
	Meter Box I.D. - T-MTB-013		Filter Exit I.D. - —	
	Umbilical I.D. - T-UMC-607		Filter Box I.D. - —	

Reference Thermometer °F	Stack	Meter In	Meter Out	Filter Exit	Impinger Exit
78	77	—	78	—	78

Probe Heat Check Start Time:________ Stop Time:________ Target Temperature: 250°F
Filter Box Heat Check Start Time:________ Stop Time:________ Target Temperature: 250°F

Run 3	Probe I.D. - T-PRB-604		Umbilical Adapter I.D. - T-UMA-012	
	Meter Box I.D. - T-MTB-013		Filter Exit I.D. - —	
	Umbilical I.D. - T-UMC-607		Filter Box I.D. - —	

Reference Thermometer °F	Stack	Meter In	Meter Out	Filter Exit	Impinger Exit
77	77	—	78	—	78

Probe Heat Check Start Time:________ Stop Time:________ Target Temperature: 250°F
Filter Box Heat Check Start Time:________ Stop Time:________ Target Temperature: 250°F

Thermocouple Simulator Setting	Primary Meter Box Stack	Meter Box I.D. - T-MTB-013 Filter Exit	Impinger Exit
50	50		50
100	100		100
200	201		
300	302		
400	400		
600	601		
800	803		
1000	1003		
1500	1503		

Tolerance Range

Stack ± 8.0 ^{0}F or ± 1.5% absolute

Filter ± 5.4 ^{0}F

Meter ± 5.4 ^{0}F

Exit ± 2.0 ^{0}F

Mercury Reference Thermometer Range: 30 to 214 ^{0}F

Thermocouple Simulator: Model CL23A, Type K, Range -328 to 2502 ^{0}F,

Serial # T-229854

Serial # T-200458

Air Compliance Testing, Inc.
(method 4.xls-Thermocouple System Audit) 9/26/2007

Job Number: 070920 B
Done By / Date: JG / 9.26.07

Method 4 Thermocouple System Audit

Run 1	Probe I.D. - T-PRB-~~804~~ 801		Umbilical Adapter I.D. - T-UMA-002/012/10	
	Meter Box I.D. - T-MTB-011		Filter Exit I.D. - —	
	Umbilical I.D. - T-UMC-603		Filter Box I.D. - T-FLB-004	
Reference Thermometer °F	**Stack**	**Meter In**	**Meter Out**	**Filter Exit**	**Impinger Exit**
72	71	71	71	—	71/72/71

Probe Heat Check Start Time: 3:00 Stop Time: 3:07 Target Temperature: 250°F
Filter Box Heat Check Start Time: 3:00 Stop Time: 3:07 Target Temperature: 250°F

Run 2	Probe I.D. - ~~T-PRB-801~~ ES		Umbilical Adapter I.D. -	
	Meter Box I.D. - ~~T-MTB-011~~ ES		Filter Exit I.D. -	
	Umbilical I.D. - ~~T-UMC-603~~ ES		Filter Box I.D. -	
Reference Thermometer °F	**Stack**	**Meter In**	**Meter Out**	**Filter Exit**	**Impinger Exit**

Probe Heat Check Start Time:________ Stop Time:________ Target Temperature: 250°F
Filter Box Heat Check Start Time:________ Stop Time:________ Target Temperature: 250°F

Run 3	Probe I.D. - T-PIT-402		Umbilical Adapter I.D. - —	
	Meter Box I.D. - T-MTB-013		Filter Exit I.D. - —	
	Umbilical I.D. - T-M20-351		Filter Box I.D. - —	
Reference Thermometer °F	**Stack**	**Meter In**	**Meter Out**	**Filter Exit**	**Impinger Exit**
73	71	—	—	—	—

Probe Heat Check Start Time:________ Stop Time:________ Target Temperature: 250°F
Filter Box Heat Check Start Time:________ Stop Time:________ Target Temperature: 250°F

Thermocouple Simulator Setting	Primary Meter Box Stack	Meter Box I.D. - T-MTB-011 ~~T-MTB~~ ES Filter Exit	Impinger Exit
50	50/48		50
100	100/98		100
200	201/200		
300	362/300		
400	400/399	**Tolerance Range**	
600	600/599	Stack ± 8.0 °F or ± 1.5% absolute	
800	802/801	Filter ± 5.4 °F	
1000	1002/1002	Meter ± 5.4 °F	
1500	1501/1501	Exit ± 2.0 °F	

Mercury Reference Thermometer Range: 30 to 214 °F

Thermocouple Simulator: Model CL23A, Type K, Range -328 to 2502 °F,

Serial # T-229854

Serial # T-200458

Job Number: 070903C
Done By / Date: ES / 9/17/10

Method 2 Post-Test Thermocouple Check

ALT-011 Post-Test Stack Thermocouple System Check Procedure

Reference Thermometer Range	-328 → 2502°F
Reference Thermometer I.D.	T-THC-008
Umbilical Cord I.D.	T-UMC-607
Temperature Display I.D.	T-MTB-013
Continuity Check Performed By:	JG

	Run 1	Run 2	Run 3	Run 4
Probe I.D.	T-PRB-602	T-PRB-603	T-PRB-602	—
Reference Thermometer Ambient Readout (°F)	71	71	71	—
Stack Temperature Thermocouple Ambient Readout (°F)	71	71	71	—
Temperature Difference (must be ±2°F)	0	0	0	—

Job Number: 070920B
Done By / Date: JG / 9.28.07
Checked By / Date: ____ / — — —
Final Check By / Date: PU / 10/23/07

Method 2 Post-Test Thermocouple Check

ALT-011 Post-Test Stack Thermocouple System Check Procedure

Reference Thermometer Range	-328 → 2502°F
Reference Thermometer I.D.	T-THC-008
Umbilical Cord I.D.	T-UMC-602
Temperature Display I.D.	T-MTB-011
Continuity Check Performed By:	JB

	Run 1	Run 2	Run 3	Run 4
Probe I.D.	T-PRB-606	T-PRB-610	T-PRB-608	–
Reference Thermometer Ambient Readout (°F)	72°	72°	72°	–
Stack Temperature Thermocouple Ambient Readout (°F)	71°	71°	71°	–
Temperature Difference (must be ±2°F)	-1°	-1°	-1°	–

Job Number: 070920 A
Done By / Date: JB / 9/28
Checked By / Date: – / –
Final Check By / Date: Pc / 9/23/07

Meter Box Pre-Test Leak Check

- ✓ Remove the front panel from the meter box
- ✓ Disconnect the fan
- ✓ Hook up the proper pump to the meter box
- ✓ Close both the fine and coarse adjustment valves
- ✓ Connect the DH hoses on the front of the meter box
- ✓ Remove the copper elbow from stainless tube at the exit side of gas meter
- ✓ Stopper the stainless tube with a rubber stopper
- ✓ Disconnect the DH static line from the orifice (bottom)
- ✓ Plug in leak check tube into the static side of the orifice
- ✓ Blowing into the leak check tube, pressurize the system to 5-7 inches and clamp off
- ✓ Hold for one minute
- ✓ No leakage should occur. If leak is present, it must be corrected
- ✓ Affix (w/ electrical tape) the copper elbow onto the stainless tube at the exit side of gas meter
- ✓ Reassemble meter box
- ✓ Plug in capped swagelok stem at sample inlet
- ✓ Start pump, bringing system vacuum to at least 15 in. Hg
- ✓ Note DGM reading, start timer 652,915
- ✓ Observe DGM for one minute
- ✓ No leakage should occur. If leak is present, it must be corrected
- ✓ Check oil wick position (should be 1/4" above the black O-ring)
- ✓ Check pump oil level (should be at fill line)

Meter Box Number MTB-011

Job Number: ~~080307~~ 070803
Done By / Date: CGI 8/15/07
Final Check By: PU 9/10/07

Air Compliance Testing, Inc.
(Pre-Cal.xls-Meter Box Pre-Test Leak Check) 8/3/2007

Method 4 Pre-Test Dry Gas Meter (006)/Orifice Calibration Data

Meter Box I.D:	T - MTB - 011
Meter Box Serial Number:	
Standard Meter I.D:	T - DGM - 006
Temp Sensor I.D:	T - ~~DGM~~ - MTB - 011
Barometer I.D:	T - BAR - 001
Leak Check: (+)	✓ (-) ✓
Meter Box Level?	✓

Standard Meter

Calibrated By: Apex Instruments Inc.
Calibration Date: May 1, 2007
Gamma: 1.0047
Serial Number: 1512377

REMOVE CAPS FROM STANDARD METER

Run 1

Pressures

ΔH: 1 in.$H_2$0
Meter Box Vac: 5 in.Hg
P Bar: 29.35 in.Hg

Meter Readings

	Time	Std Meter	Meter Box
Begin	0	987.142	665.239
End	12	993.965	671.917
Net	12	6.823	6.678

(>5.0 dcf)

Temperatures

Time (min)	Std Meter In	Std Meter Out	Meter Box In	Meter Box Out
4	85	85	93	85
8	85	85	94	86
12	86	86	96	88
Avg.	85.33		90.33	

Run 2

Pressures

ΔH: 2 in.$H_2$0
Meter Box Vac: 5 in.Hg
P Bar: 29.35 in.Hg

Meter Readings

	Time	Std Meter	Meter Box
Begin	0	995.074	673.024
End	12	004.552	682.516
Net	12	9.478	9.492

(>5.0 dcf)

Temperatures

Time (min)	Std Meter In	Std Meter Out	Meter Box In	Meter Box Out
4	85	85	96	87
8	85	85	97	88
12	86	86	96	88
Avg.	85.33		92.00	

Run 3

Pressures

ΔH: 3 in.$H_2$0
Meter Box Vac: 5 in.Hg
P Bar: 29.35 in.Hg

Meter Readings

	Time	Std Meter	Meter Box
Begin	0	005.100	683.068
End	12	016.757	694.837
Net	12	11.657	11.769

(>5.0 dcf)

Temperatures

Time (min)	Std Meter In	Std Meter Out	Meter Box In	Meter Box Out
4	86	85	97	89
8	86	86	100	89
12	86	86	99	90
Avg.	85.83		94.00	

ΔH:	ΔH@	γ
1	1.788	1.0333
2	1.848	1.0104
3	1.829	1.0025
AVG.	1.822	1.0154

Job Number: 070803
Done By / Date: CG / 8/3/07
Checked By / Date: — / — : — / —
Final Check By / Date: PU 8/10/07

Air Compliance Testing, Inc.
(070803.xls-Pre-Test Dry Gas Meter (006)) 8/3/2007

Method 4 Pre-Test Meter Console (006) Calibration

Run No.	Calibration Meter Correction Factor (Yc)	Barometric Press. (Pb) (in.Hg)	Delta H (in w.g.)	Meter Box Volume (Vd) (cu.ft.)	Average Meter Box Temperature (Tm) (F)	Standard Meter Volume (Vc) (cu.ft.)	Standard Meter Temperature (Tc) (F)	Time (min.)	Gamma (Y)	Tolerance (plus or minus 0.02)	Delta H@	Tolerance (plus or minus 0.2)
1	1.0047	29.35	1.000	6.678	90.33	6.823	85.33	12	1.0333	0.017921	1.788	-0.033
2	1.0047	29.35	2.000	9.492	92.00	9.478	85.33	12	1.0104	-0.004997	1.848	0.026
3	1.0047	29.35	3.000	11.769	94.00	11.657	85.83	12	1.0025	-0.012924	1.829	0.007
										PASS		PASS
							Average		1.0154	PASS	1.822	

Pump Number T-PMP- 013

Meter Box Number T-MTB- 013

Reference Meter Number T-DGM- 006

Add Values to 30 Day Calibration History
Add Values to Dry Gas Meter Calibration History
Tag Meter Box

Job Number: 07080.3
Done By / Date: CG / 8/13/07
Checked By / Date: — / — : — / —
Final Check By / Date: RL / 9/10/07

Meter Box Pre-Test Leak Check

✓ Remove the front panel from the meter box
– Disconnect the fan
✓ Hook up the proper pump to the meter box
✓ Close both the fine and coarse adjustment valves
✓ Connect the DH hoses on the front of the meter box
✓ Remove the copper elbow from stainless tube at the exit side of gas meter
✓ Stopper the stainless tube with a rubber stopper
✓ Disconnect the DH static line from the orifice (bottom)
✓ Plug in leak check tube into the static side of the orifice
✓ Blowing into the leak check tube, pressurize the system to 5-7 inches and clamp off
✓ Hold for one minute
✓ No leakage should occur. If leak is present, it must be corrected
✓ Affix (w/ electrical tape) the copper elbow onto the stainless tube at the exit side of gas meter
✓ Reassemble meter box
✓ Plug in capped swagelok stem at sample inlet
✓ Start pump, bringing system vacuum to at least 15 in. Hg
✓ Note DGM reading, start timer
✓ Observe DGM for one minute
✓ No leakage should occur. If leak is present, it must be corrected
✓ Check oil wick position (should be 1/4" above the black O-ring)
✓ Check pump oil level (should be at fill line)

Meter Box Number T-MTB-013

Job Number: 070803
Done By / Date: JG / 8.3.07
Final Check By: PU / 9/10/07

Method 4 Pre-Test Dry Gas Meter (006)/Orifice Calibration Data

Meter Box I.D:	T - MTB - 013
Meter Box Serial Number:	0408004
Standard Meter I.D:	T - DGM - 006
Temp Sensor I.D:	T - DGM - 006
Barometer I.D:	T - BAR - 001
Leak Check: (+) (-)	Pass
Meter Box Level?	Yes

Standard Meter

Calibrated By: Apex Instruments Inc.

Calibration Date: May 1, 2007

Gamma: 1.0047

Serial Number: 1512377

REMOVE CAPS FROM STANDARD METER

Run 1

Pressures

ΔH: 1.0 in.H_2O

Meter Box Vac: 5.0 in.Hg

P Bar: 29.34 in.Hg

Meter Readings

	Time	Std Meter	Meter Box
Begin	0	887.113	527.480
End	12	893.768	534.193
Net	12	6.655	6.713

(>5.0 dcf)

Temperatures

Time (min)	Std Meter In	Std Meter Out	Meter Box In	Meter Box Out
4	81	81	–	83
8	81	81	–	83
12	81	82	–	84
Avg.	81.17		83.33	

Run 2

Pressures

ΔH: 2.0 in.H_2O

Meter Box Vac: 5.0 in.Hg

P Bar: 29.34 in.Hg

Meter Readings

	Time	Std Meter	Meter Box
Begin	0	898.705	539.200
End	12.5	908.631	549.294
*Net	12.5	9.926	10.094

(>5.0 dcf)

Temperatures

Time (min)	Std Meter In	Std Meter Out	Meter Box In	Meter Box Out
4	82	82	–	87
8	82	82	–	88
12	82	82	–	89
Avg.	82.00		88.00	

Run 3

Pressures

ΔH: 3.0 in.H_2O

Meter Box Vac: 5.0 in.Hg

P Bar: 29.34 in.Hg

Meter Readings

	Time	Std Meter	Meter Box
Begin	0	913.041	553.779
End	12	924.983	565.947
Net	12	11.942	12.168

(>5.0 dcf)

Temperatures

Time (min)	Std Meter In	Std Meter Out	Meter Box In	Meter Box Out
4	82	82	–	~~96~~ 91
8	82	82	–	92
12	83	83	–	92
Avg.	82.33		~~95~~ 91.67	

ΔH:	ΔH@	Y
1.0	1.876	~~0.995~~ .9975
1.0	1.820	.9939
1.0	1.729	.9955
AVG.	1.808	.9957

Job Number: 070803

Done By / Date: JG / 8.3.07

Checked By / Date: – / – : – / –

Final Check By / Date: RU 1918107

Air Compliance Testing, Inc.

(Pre-Cal.xls-Pre-Test Dry Gas Meter (006)) 6/15/2007

Method 4 Pre-Test Meter Console (006) Calibration

Run No.	Calibration Meter Correction Factor (Yc)	Barometric Press. (Pb) (in.Hg)	Delta H (in w.g.)	Meter Box Volume (Vd) (cu.ft.)	Average Meter Box Temperature (Tm) (F)	Standard Meter Volume (Vc) (cu.ft.)	Standard Meter Temperature (Tc) (F)	Time (min.)	Gamma (Y)	Tolerance (plus or minus 0.02)	Delta H@	Tolerance (plus or minus 0.2)
1	1.0047	29.34	1.000	6.713	83.33	6.655	81.17	12	0.9975	0.001852	1.876	0.068
2	1.0047	29.34	2.000	10.094	88.00	9.926	82.00	12.5	0.9939	-0.001722	1.820	0.012
3	1.0047	29.34	3.000	12.168	91.67	11.942	82.33	12	0.9955	-0.000131	1.729	-0.079
										PASS		PASS
							Average		0.9957	PASS	1.808	

Pump Number T-PMP- 013

Meter Box Number T-MTB- 013

Reference Meter Number T-DGM- 006

Add Values to 30 Day Calibration History
Add Values to Dry Gas Meter Calibration History
Tag Meter Box

Job Number: 070803
Done By / Date: JG / 8/3/07
Checked By / Date: — / — : — / —
Final Check By / Date: PV [illegible] 07

Method 4 Post-Test Dry Gas Meter (006)/Orifice Calibration Data

Meter Box I.D:	T - MTB - 013
Meter Box Serial Number:	0408004
Standard Meter I.D:	T - DGM - 006
Temp Sensor I.D:	T - DGM - 006
Barometer I.D:	T - BAR - 001
Leak Check: (+) ~~(-)~~	NA
Meter Box Level?	Yes

Standard Meter

Calibrated By: Apex Instruments Inc.

Calibration Date: May 1, 2007

Gamma: 1.0047

Serial Number: 1512377

REMOVE CAPS FROM STANDARD METER

Run 1

Pressures

ΔH:	1.52	$in.H_20$
Meter Box Vac:	3.5	in.Hg
P Bar:	29.41	in.Hg

Meter Readings

	Time	Std Meter	Meter Box
Begin	0	96.963	989.199
End	12	105.131	997.463
Net	12	8.168	8.264

(>5.0 dcf)

Temperatures

Time (min)	Std Meter In	Std Meter Out	Meter Box In	Meter Box Out
4	71	71	–	73
8	71	72	–	74
12	71	72	–	75
Avg.	71.33		74.00	

Run 2

Pressures

ΔH:	1.52	$in.H_20$
Meter Box Vac:	3.5	in.Hg
P Bar:	29.41	in.Hg

Meter Readings

	Time	Std Meter	Meter Box
Begin	0	105.131	997.463
End	12	113.283	1005.733
Net	12	~~8.177~~ 8.152	8.270

(>5.0 dcf)

Temperatures

Time (min)	Std Meter In	Std Meter Out	Meter Box In	Meter Box Out
4	71	73	–	76
8	71	72	–	77
12	71	73	–	77
Avg.	71.83		76.67	

Run 3

Pressures

ΔH:	1.52	$in.H_20$
Meter Box Vac:	3.5	in.Hg
P Bar:	29.41	in.Hg

Meter Readings

	Time	Std Meter	Meter Box
Begin	0	113.283	5.733
End	12.5	121.732	14.323
Net	*12.5	8.449	8.590

(>5.0 dcf)

Temperatures

Time (min)	Std Meter In	Std Meter Out	Meter Box In	Meter Box Out
4	71	73	–	78
8	71	73	–	79
12	71	74	–	80
Avg.	72.17		79.00	

ΔH:	ΔH@	γ
1.52	1.852	.9942
1.52	~~1.867~~ 1.854	~~.9949~~ .9956
1.52	1.867	.9971
AVG.	~~1.862~~ 1.857	~~.9944~~ .9956

Job Number: 070926 B

Done By / Date: JG / 9.28.07

Checked By / Date: JG / 9.28.07 : – / –

Final Check By / Date: AV / 10/12/07

Air Compliance Testing, Inc.

(Post-Cal.xls-Post-Test Dry Gas Meter (006)) 6/15/2007

Method 4 Post-Test Meter Console (006) Calibration

Run No.	Calibration Meter Correction Factor (Yc)	Barometric Press. (Pb) (in.Hg)	Delta H (in w.g.)	Meter Box Volume (Vd) (cu.ft.)	Average Meter Box Temperature (Tm) (F)	Standard Meter Volume (Vc) (cu.ft.)	Standard Meter Temperature (Tc) (F)	Time (min.)	Gamma (Y)	Tolerance (plus or minus 0.02)	Delta H@	Tolerance (plus or minus 0.2)
1	1.0047	29.41	1.520	8.264	74.00	8.168	71.33	12	0.9942	-0.001407	1.852	-0.005
2	1.0047	29.41	1.520	8.270	76.67	8.152	71.83	12	0.9956	-0.000060	1.854	-0.004
3	1.0047	29.41	1.520	8.590	79.00	8.449	72.17	12.5	0.9971	0.001467	1.867	0.009
										PASS		PASS
							Average		0.9956	PASS	1.857	

Pump Number T-PMP- 013

Meter Box Number T-MTB- 013

Reference Meter Number T-DGM- 006

Add Values to 30 Day Calibration History ✓
Add Values to Dry Gas Meter Calibration History ✓
Tag Meter Box

Job Number: 070920 B
Done By / Date: JG / 9-28-07
Checked By / Date: — / —
Final Check By / Date: PL / 10/22/07

Method 4 DGM Calibration History

Type	Date	Standard Meter Serial #	Meter Box #	Delta H	Delta H@	Delta H	Delta H@	Delta H	Delta H@	Gamma	Average Delta H@	By
Post	9/10/07	1512377	006	1.49	1.685	1.49	1.681	1.49	1.687	.9920	1.684	KG
Post	9/10/07	1512377	013	1.72	1.912	1.72	1.929	1.72	1.911	.9993	1.917	KG
Post	9.14.07	1512377	002	1.11	1.882	1.11	1.882	1.11	1.872	1.0185	1.879	JG
Pre	9/20/07	1512377	003	1.0	1.704	2.0	1.755	3.0	1.688	1.0056	1.716	KG
Pre	9/20/07	1512377	015	1.0	2.103	2.0	2.202	3.0	2.127	.9960	2.144	KG
Pre	9/20/07	1512377	002	1.0	1.858	2.0	1.805	3.0	1.759	1.0055	1.807	KG
Pre	9/20/07	1512377	009	1.0	1.726	2.0	1.742	3.0	1.710	.9967	1.726	KG
Pre	9/20/07	1512377	006	1.0	1.881	2.0	2.007	3.0	2.027	.9956	1.972	KG
Post	9.28.07	1512377	013	1.52	1.852	1.52	1.854	1.52	1.867	.9956	1.857	JG
PRE	9.28.07	1512377	012	1.0	1.782	2.0	1.810	3.0	1.800	1.0066	1.797	JB
PRE	10.1.07	1512377	016	1.0	1.777	2.0	1.759	3.0	1.637	1.0051	1.725	JB
Pre	10/3/07	1512377	014	1.0	1.705	2.0	1.793	3.0	1.766	.9925	1.755	KG
Pre	10/4/07	1512377	013	1.0	1.962	2.0	2.007	3.0	1.988	.9994	1.986	KG
Pre	10/4/07	1512377	010	1.0	1.720	2.0	1.733	3.0	1.684	.9913	1.713	KG
Post	10/19/07	1512377	008	.95	1.652	.95	1.659	.95	1.637	.9992	1.648	KG
Pre	10/23/07	1512377	011	1.0	1.812	2.0	1.859	3.0	1.838	1.0028	1.837	ES

Air Compliance Testing, Inc.
(method 4.xls-DGM Calibration History) 6/28/2005

Method 4 DGM Calibration History

Type	Date	Standard Meter Serial #	Meter Box #	Delta H	Delta H@	Delta H	Delta H@	Delta H	Delta H@	Gamma	Average Delta H@	[illegible]
PRE	6/5/07	50172	002	1	1.699	2	1.793	3	1.759	1.0055	1.750	CG
PRE	6/6/07	50172	014	1	1.690	2	1.841	3	1.752	0.9885	1.761	CG
PRE	6/6/07	50172	013	1	1.875	2	1.751	3	1.690	1.0058	1.772	CG
PRE	6/6/07	50172	016	1	2.012	2	1.995	3	1.789	1.0122	1.932	CG
PRE	6/6/07	50172	003	1	1.692	2	1.659	3	1.752	1.0151	1.701	CG
PRE	6/7/07	50172	015	1	2.031	2	1.854	3	1.735	0.9981	1.873	CG
PRE	6.15.07	1512377	008	1	1.590	2	1.610	3	1.570	0.9998	1.590	JG
Post	6.15.07	1512377	006	1.08	1.788	1.08	1.789	1.08	1.785	0.9940	1.787	JG
Post	6.15.07	1512377	015	0.63	2.100	0.63	2.088	0.63	2.091	1.0034	2.093	JG
Post	7/2/07	1512377	002	1.24	1.938	1.24	1.957	1.24	1.938	1.0159	1.944	KG
Post	7/2/07	1512377	003	1.18	1.752	1.18	1.744	1.18	1.777	1.0082	1.758	KG
Post	6/6/07	1512377	004	1.727	1.727	2	1.651	2	1.576	1.0170	1.651	CG
Post	6/6/07	1512377	004	1.8	1.683	1.8	1.443	1.8	1.668	1.0192	1.614	CG
Post	7/9/07	1512377	002	1.37	1.855	.37	1.867	.37	1.861	1.0185	1.861	TBS
Pre	7/9/07	~~303~~ 1512377	012	1	1.786	2	1.862	3	1.835	1.0084	1.828	T
PRE	8.3.07	1512377	010	1.0	1.708	2.0	1.698	3.0	1.663	0.9918	1.690	JG
PRE	8.3.07	1512377	013	1.0	1.876	2.0	1.820	3.0	1.729	0.9957	1.808	JG
PRE	8.3.07	1512377	014	1.0	1.715	2.0	1.822	3.0	1.770	0.9939	1.769	JG
PRE	8-3-07	1512377	015	1.0	1.866	2.0	1.791	3.0	1.659	1.0070	1.772	CG
PRE	8-3-07	1512377	009	1.0	1.668	2.0	1.682	3.0	1.699	1.0016	1.683	CG
PRE	8-3-07	1512377	011	1.0	1.788	2.0	1.848	3.0	1.829	1.0154	1.822	CG
PRE	8-3-07	1512377	002	1.0	1.849	2.0	1.807	3.0	1.777	0.9979	1.811	CG
Post	8.3.07	1512377	012	.94	1.805	.94	1.817	.94	1.821	1.0108	1.814	JG
Pre	7/11/07	1512377	004	1	1.882	2.0	2.076	3.0	2.088	1.0143	2.015	CG
Post	8/24/07	1512377	015	1.2	1.982	1.2	1.989	1.2	1.990	.9966	1.987	KG
Post	8/24/07	1512377	015	1.6	1.838	1.6	1.848	1.6	1.843	.9974	1.843	KG
Pre	8/27/07	1512377	006	1	1.725	2	1.710	3	1.649	0.9919	1.695	JG
Pre	8/27/07	1512377	008	1	1.690	2	1.668	3	1.622	1.0041	1.644	ES
Pre	8/27/07	1512377	016	1	1.529	2	1.623	3	1.528	1.0049	1.577	ES
PRE	9/7/07	105085	004	1	2.059	2	2.063	3	2.134	.9902	2.085	CG
PRE	9/7/07	303015	012	1	1.713	2	1.736	3	1.707	1.0090	1.719	[illegible]

Digital Pressure Gauge Calibration History

Digital Pressure Gauge ID#	(mm Hg) Mercury Barometer	(mmHg) DPG	(mmHg) Difference	(≤2mm Hg) pass/fail	By whom	Date	Adjusted?	(°F) Temp.
T-DPG-007	738	739	+1	PASS	[illegible]	6-4-7	NO	78
T-DPG-002	738	739	+1	PASS	[illegible]	6-4-7	No	78
T-DPG-003	748	749	1	Pass	JG	6.15.07	No	74
T-DPG-005	748	748	0	Pass	JG	6.15.07	No	74
T-DPG-006	748	748	0	Pass	JG	6.15.07	No	74
T-DPG-008	748	748	0	Pass	JG	6.15.07	No	74
T-DPG-008	748	749	1	PASS	[illegible]	6.29.07	NO	80°
T-DPG-007	748	749	1	Pass	[illegible]	6.29.07	NO	80°
T-DPG-003	745	744	1	Pass	TBS	7/13/07	No	76°
T-DPG-005	745	745	0	Pass	TBS	7/13/07	No	76°
T-DPG-006	745	745	0	Pass	TBS	7/13/07	No	76°
T-DPG-007	745	744	1	Pass	TBS	7/13/07	No	76°
T-DPG-008	745	745	0	Pass	TBS	7/13/07	No	76°
T-DPG-008	748	748	1	PASS	[illegible]	7-20-07	NO	76
T-DPG-007	747	747	0	PASS	[illegible]	7-20-07	NO	76
T-DPG-001	747	747	0	PASS	[illegible]	7-20-07	NO	76
T-DPG-007	748	746	1	PASS	[illegible]	7-20-07	NO	76
T-DPG-003	748	747	1	PASS	TBS	7/26/07	NO	74°
T-DPG-003	741	741	0	Pass	JG	8.8.07	No	84
T-DPG-005	741	742	1	Pass	JG	8.8.07	No	84
T-DPG-007	741	742	1	Pass	JG	8.8.07	No	84
T-DPG-008	741	742	1	Pass	JG	8.8.07	No	84
T-DPG-005	745	744	1	Pass	KG	8/24/07	no	82
T-DPG-003	742	743	1	Pass	JG	8.24.07	NO	89
T-DPG-006	745	744	1	Pass	KG	8/24/07	no	82
T-DPG-001	742	742	0	Pass	KG	8/24/07	no	89
T-DPG-004	748	747	-1	Pass	JG	8.31.07	No	76
T-DPG-007	748	748	0	Pass	JG	8.31.07	No	76
T-DPG-004	744	744	0	PASS	[illegible]	9-7-07	NO	88
T-DPG-003	752	750	-2	Pass	JG	9.17.07	Yes	74
T-DPG-004	752	751	-1	Pass	JG	9.17.07	No	74
T-DPG-005	752	752	0	Pass	JG	9.17.07	No	74
T-DPG-006	752	752	0	Pass	JG	9.17.07	No	74
T-DPG-007	752	752	0	Pass	JG	9.17.07	No	74
T-DPG-008	752	753	1	Pass	JG	9.17.07	No	74
T-DPG-001	746	746	0	Pass	JG	9.28.07	No	70
T-DPG-003	746	746	0	Pass	JG	9.28.07	No	70
T-DPG-004	746	746	0	Pass	JG	9.28.07	No	70
T-DPG-005	746	747	1	Pass	JG	9.28.07	No	70
T-DPG-006	746	747	1	Pass	JG	9.28.07	No	70
T-DPG-007	746	746	0	Pass	JG	9.28.07	No	70
T-DPG-008	746	747	1	Pass	JG	9.28.07	No	70
T-DPG-004	746	744	-2	PASS	[illegible]	10/3/07	NO	72
T-DPG-001	733	732	1	Pass	ES	10-19-07	NO	73
T-DPG-003	733	732	1	PASS	ES	10-19-07	NO	73
T-DPG-001	731	731	2	Pass	ES	10-19-07	NO	73
DPG-006	733	732	1	Pass	KG	10/19/07	no	73
T-DPG-008	732	733	1	Pass	JG	10.19.07	No	74

Pallflex® Filters

Description: Wide range of filters uniquely suited for a broad range of air monitoring applications. Can be used for high temperature and hot gas air monitoring applications.

Specifications

Description	Tissuquartz Filters	Emfab Filters	Fiberfilm Filtes
Filter Media	Pure quartz, no binder	Borosilicate microfibers reinforced with woven glass cloth and bonded with PTFE	Heat resistant borosilicate glass fiber coated with fluorocarbon. (TFE)
Diameter	25 - 90 mm (and 8 x 10 in.)	12 - 142 mm (and 8 x 10 in.)	25 - 100 mm (and 8 x 10 in.)
Typical Thickness	432 µm (17 mils)	178 µm (7 mils)	203 µm (8 mils)
Typical Filter Weight	5.8 mg/cm^2	5.0 mg/cm^2	3.4 mg/cm^2
Typical Water Flow Rate at 0.35 bar (5 psi)	220 $mL/min/cm^2$	32 $mL/min/cm^2$	220 $mL/min/cm^2$
Typical Air Flow Rate at 0.7 bar (10 psi)	73 $L/min/cm^2$	68 $L/min/cm^2$	180 $L/min/cm^2$
Maximum Operating Temperature - Air	1093 °C (2000 °F)	260 °C (500 °F)	315.5 °C (600 °F)
Typical Aerosol Retention*	99.90%	99.90%	96.40%
pH in Boiled Water Extract	6.5 - 7.5	Not available	Not available

Following ASTM D 2986-71 0.3 um (DOP) at 32 L/min/100 cm^2 filter media

APEX INSTRUMENTS REFERENCE METER VERIFICATION
USING WET-TEST METER #11AE6
2-POINT ENGLISH UNITS

Calibration Meter Information	
Wet Test Meter Model #	AL20
Wet Test Meter Serial #	11AE6
Wet Test Meter Gamma	1.00000

Calibration Conditions			
Date	Time	1-May-07	10:39
Barometric Pressure		29.68	in Hg
Calibration Technician		SH	
DGM Model Number		S120	
DGM Serial Number		1512377	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	°R/in Hg

Calibration Data												Results		
Run Time	Metering Console						Calibration Meter					Dry Gas Meter		
												Calibration Factor		Flowrate
Elapsed	DGM Input Pressure	Volume Initial	Volume Final	Sample Volume	Outlet Temp Initial	Outlet Temp Final	Volume Initial	Volume Final	Sample Volume	Outlet Temp Initial	Outlet Temp Final	From 15 Point	Current	Std & Corr
(Θ)	(P_m)	(V_{mi})	(V_{mf})		(t_{mi})	(t_{mf})	(V_{wi})	(V_{wf})		(t_{wi})	(t_{wf})	(Y)	(Y)	($Q_{m(std)(corr)}$)
min	in H_2O	cubic feet	cubic feet	cubic feet	°F	°F	cubic feet	cubic feet	cubic feet	°F	°F			cfm
6	-5.2	848.7425	856.6575	7.915	77	79	9807.28	9815.031	7.751	76	75.9	0.9973	0.9959	1.262
											Variation	0.14%	must be less than 1.5%	
10	-2.7	656.6575	663.2957	6.6382	79	79	9815.031	9821.581	6.55	75.9	75.9	1.0067	0.9991	0.640
											Variation	0.75%	must be less than 1.5%	

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, App A, Method 5, Paragraph 7.1.2.2, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 3785, certificate # F107, which is traceable to the National Bureau of Standards (N.I.S.T.).

Signature Sherman Howell Date 5-1-07

APEX INSTRUMENTS REFERENCE METER CALIBRATION
USING WET-TEST METER #11AE6
15-POINT ENGLISH UNITS

Calibration Meter Information	
Wet Test Meter Model #	AL20
Wet Test Meter Serial #	11AE6
Wet Test Meter Gamma	1.00000

Calibration Conditions			
Date	Time	30-Apr-03	13:10
Barometric Pressure		29.6	in Hg
Calibration Technician		RM	
DGM Serial Number		1512377	

Factors/Conversions		
Std Temp	528	°R
Std Press	29.92	in Hg
K_1	17.647	°R/in Hg

Calibration Data										Results		
Run Time	Dry Gas Meter					Calibration Meter				Dry Gas Meter		
	Meter	Volume	Volume	Outlet Temp	Outlet Temp	Volume	Volume	Outlet Temp	Outlet Temp	Calibration Factor		Flowrate
Elapsed	Pressure	Initial	Final	Initial	Final	Initial	Final	Initial	Final	Value	Variation	Std & Corr
(Θ)	(P_m)	(V_{mi})	(V_{mf})	(t_{mi})	(t_{mf})	(Vw)	(Vw)	(t_w)	(t_w)	(Y)	$(Y_{max}-Y_{min})$	$(Q_{m(std)(corr)})$
min	in H_2O	cubic feet	cubic feet	°F	°F	cubic feet	cubic feet	°F	°F			cfm
5.00	-6.4	29.796	36.104	85	85	663.955	670.060	79	79	0.9956		1.164
5.00	-6.4	36.104	42.393	86	86	670.060	676.150	79	79	0.9977		1.161
5.00	-6.4	42.393	48.672	86	86	676.150	682.235	79	79	0.9985	0.003	1.161
										0.9973	Averages	1.162
6.00	-4.8	48.672	54.768	87	88	682.235	688.190	79	79	1.0019		0.963
6.00	-4.8	73.069	79.184	89	89	708.025	711.960	79	79	1.0046		0.963
6.00	-4.8	79.184	85.282	89	89	711.980	717.920	79	79	1.0051	0.003	0.960
										1.0039	Averages	0.962
34.50	-3.6	85.282	112.162	89	89	717.920	744.235	79	79	1.0061		0.739
8.00	-3.6	112.162	118.366	89	89	744.235	750.330	79	79	1.0074		0.739
8.25	-3.6	118.366	124.614	89	89	750.330	756.620	79	79	1.0066	0.001	0.740
										1.0067	Averages	0.739
10.00	-2.7	124.614	130.461	89	90	756.620	762.170	79	80	1.0087		0.538
10.00	-2.7	130.461	136.094	90	90	762.170	767.700	80	80	1.0071		0.535
10.00	-2.7	136.094	141.733	89	89	767.700	773.245	80	80	1.0065	0.002	0.536
										1.0074	Averages	0.536
13.00	-2.3	141.733	147.474	89	89	773.245	778.695	80	80	1.0063		0.420
13.00	-2.3	147.474	153.208	89	89	778.695	784.550	80	80	1.0084		0.421
13.00	-2.3	153.208	158.947	89	89	784.550	790.215	80	80	1.0093	0.003	0.422
										1.0080	Averages	0.421
									Overall Average Y	1.0047		

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, the variation between the maximum and minimum values at each flow rate must not exceed 0.030.
Note: For the Overall Average Calibration Factor, Y, the acceptable range is between 0.95 and 1.05.

I certify that the above Dry Gas Meter was calibrated in accordance with USEPA Methods, CFR 40 Part 60, using the Precision Wet Test Meter # 11AE6, which in turn was calibrated using the American Bell Prover # 3785, certificate # F107, which is traceable to the National Bureau of Standards (N.I.S.T.).

Signature

Date 04/30/03

OMEGA ENGINEERING, INC.
An OMEGA Technologies Company

Certificate of Calibration

Customer:	AIR COMPLIANCE TESTING
Customer P.O.:	OPS224
Instrument:	Omega CL23A
Work Order Number:	702998714
Description:	CALIBRATOR THERMOMETER
Serial Number:	T-229854
Equipment I.D.#:	702998714
A.R. Number:	702-4171

Cal-3

Omega Engineering, Inc. hereby certifies that the above instrumentation has been calibrated and tested to **meet or exceed** the published specifications. This calibration and testing was performed using instrumentation and standards that are traceable to the **National Institute of Standards and Technology**. Omega Engineering, Inc. is in compliance with ISO 10012-1, ISO 9001:2000 and ANSI/NCSL Z540-1-1994. This certificate shall not be reproduced, except in full, without the written consent of Omega Engineering, Inc.

CALIBRATION INFORMATION

Cal Date: 22-Feb-07
Cal Due Date: 22-Feb-08

Temperature: 22 C ± 5 C
Humidity: 40% ± 20%

Absolute Uncertainty: 0.19F
Comments:

Pass: Y **Technician:** VA
Procedure: QAP-2100

Seals OK: No
Certificate #: 702998714

STANDARDS USED FOR CALIBRATION

Asset Number	Description	NIST Traceable Number	Cal. Date	Due Date
ST-098-04	FLUKE 5700A Multicalibrator	10NNST09804	19-Mar-06	19-Mar-07
CL-098-19	Omega TRCIII Ice Point	10NNCL09819	21-Jul-06	21-Jul-07
DM-098-22	Agilent 34401A Multimeter	10NNDM09822	11-Aug-06	11-Aug-07

Metrology Technician:

Quality Assurance Inspector:

OMEGA Engineering, Inc., One Omega Circle, P.O. Box 336, Bridgeport, NJ 08014-0336 Telephone: (856) 467-4200 • FAX: (856) 467-1212
www.omega.com e-mail: info@omega.com

LB&CS
LAKE BALANCE & CALIBRATION SERVICES
"Unsurpassed Quality and Precision since 1986"

LAKE BALANCE COMPANY INC.
PO Box 215 • Madison, Ohio 44057-0215
(440) 428-3993 • (800) 334-6756 • FAX (440) 428-2662

Service and Calibration Report

Customer	Bldg.	Rm#	Individual	Instrument	Page 5 of 7
AIR COMPLIANCE 5525 CANAL RD. VALLEYVIEW, OHIO 44125	MAIN	LAB		Cust. # A-BAL-007 Mfr AND Model # EK-1200i Serial # EP 1861726	Cal. Point — Full Scale 1200g Grads 0.1g

Certificate	Standard	QSP	QWI	Environment Conditions	Ambient Temp	Relative Humidity	Date Calibrated	Date Due
№ 9271	17025	175.4	02	GOOD	18.5C	41.4%	2/23/07	2/28/08

Units	As Found Data	Final Test Data	Decreasing Load	Strain Load
0g	0.0g	0.0g	1200.0g	
100g	100.0g	100.0g	800.0g	N/A
500g	500.0g	500.0g	500.0g	
800g	800.0g	800.0g	100.0g	
1200g	1200.0g	1200.0g	0.0g	

Offset\Corner Load

	Before	After
A	0.0g	S
B	0.0g	A
C	0.0g	M
D	0.0g	E

Comments

Parts Installed

Part Description	Qty	Price Each

Standards Used	NIST Traceable No.	Serial No.	Class	Standard Due Date
5KgWT SET	0739	9120	1	4/27/07

Uncertainty of measurement in this report is taken into consideration if entered into box marked.

Pass/Fail or in/out of tolerance are the opinions of Lake Balance Company from measurements made, procedures, professional experience, and the uncertainties associated with this measurement.

Uncertainty of Measurement (K=2): 9.06 mg

Passed	Failed
✓	

Tech Rep [signature]
Customer
Date

Superior Quality Emission Testing.

Valid Results Guaranteed.

Air Compliance Testing, Inc.

P.O. Box 41156 Cleveland, Ohio 44141
1-800-EPA-AIR1 www.aircomp.com
testing@aircomp.com

David Hearne
Cleveland Department of Public Health
1925 St Clair Ave
Cleveland, OH 44114

Dear David:

This letter accompanies the attached Intent to Test (ITT) Notification Form that we have completed on the behalf of our client, BF Goodrich Plating, located in Cleveland, OH. The purpose of this emissions testing project is to satisfy the testing requirements described in section A.V.2 of the Ohio EPA Title V permit for each emission unit.

The scope of this testing project is to measure Total Chromium using EPA Method 306 from the Hard Chrome Electroplating Tanks 1, 2B, and 2F (P001) and Hard Chrome Plating Tanks 7 - 11 (P002) at their respective Scrubber Exhaust Stacks. The above testing will be conducted during 10,825 amp-hr/hr (P001) and during 3,000 amp-hr/hr (P002) rectifier outputs respectively.

As is written in this ITT, a date of September 27, 2007 has been selected as the test day(s) with testing equipment set-up occurring on the day before. Typically Run No. 1's start time is targeted for 8:00 am. If this start time changes, Air Compliance Testing or facility personnel will contact you in advance to notify you of the new starting time.

If you have any questions regarding the scope of this testing project, the scheduled test day, or the process(es) being tested, please don't hesitate to call Greg Goga of BF Goodrich Plating at 216-429-4423, or myself, and we would be happy to assist you in any way possible.

Thank you again for your careful consideration, and I am looking forward to working with you on this upcoming compliance testing project.

Sincerely,

Air Compliance Testing, Inc.

By:______________________________
David B. Monro
Project Manager

cc: Greg Goga, BF Goodrich Plating

INTENT TO TEST NOTIFICATION (One Emissions Unit Per Sheet)

AGENCY USE ONLY
Date Received
No. Assigned

Facility Premise No. 1318005949
Emissions Unit PTI No. Title V

Proposed Test Date September 27, 2007
SCC Code 30901018

A. Facility Contact Information:

Name BF Goodrich Plating
Address 2800 E 33rd St, Cleveland OH 44115-3602
Contact Person Greg Goga
Telephone Number (O) 216-429-4423 (Cell) N/A
E-Mail greg.goga@goodrich.com

Testing Firm Information:

Name Air Compliance Testing, Inc.
Address PO Box 41156, Cleveland OH 44141-0156
Contact Person David B. Monro
Telephone Number (O) 216 525-0900 (Cell) 440-821-7814
E-Mail davem@aircomp.com

B. Test Location Information

Name BF Goodrich Plating
Address 2800 E. 33 St., Cleveland OH 44115

Contact Person Greg Goga
Telephone Number (Office) 216-429-4423 (Cell) N/A

C. Test Plan and Emissions Unit Information Table: List the applicable information under each respective column heading.

Emission Unit	StackID	Test Location	Control Equipment	Monitoring Equipment	Pollutant(s) to be Tested	EPA Test Method	Audit Sample Available?	Number of Sampling Points	Total Time per Test Run (min)	Number of Sampling Runs
Hard Chrome Plating Tanks 7 - 11 (P002)	B	Scrubber Exhaust Stack	Scrubber	Pressure Drop	Stack Gas Velocity and Volumetric Flow Rate	1,2, and 4	No	Up to 24	120	3
Hard Chrome Plating Tanks 7 - 11 (P002)	B	Scrubber Exhaust Stack	Scrubber	Pressure Drop	Total Chromium	306	Yes	up to 24	120	3

Source is testing to comply with (check all that apply): **Title V Permit**

D. What is the maximum rated capacity? **3,000 amp-hr/hr**

Will Emissions Unit be operated at the maximum capacity given in its permit-to-install or permit-to-operate? **Yes [X] No [ ]**

Specify how the operating rate will be determined during testing? (*See notes 1, 2 and 3 on page 2.): **Normal facility recordkeeping procedures.**

Are any modifications to USEPA Reference Method(s) proposed? If "no", then no modification, however minor, will be accepted. If yes, list each test method and section being modified, and attach a detailed modification description and justification: **Yes [ ] No [X]**

Sampling Location(s): **Inlet [ ] Outlet [X] Simultaneous [ ]**

Will cyclonic flow check(s) be conducted? **Yes [X] No [ ] If potential to be physically possible exists.**

Fuel Sampling: **Coal-Proximate [ ] Ultimate [ ] Other [X] If other specify: N/A**

Emission Rate to be calculated using: **F-Factor [ ] Ultimate Coal Analysis [ ] Other [X] If other specify: As dictated by EPA Method 306 calculation algorithms**

Does the test method require audit samples? **Yes [X] No [ ]: Method 306**

Has any maintenance or parts replacement been performed on the emissions unit or the control equipment within the last year? **Yes [X] No [ ]: Normal routine maintenance**

(Note: Some maintenance, such as installing new filter bags in a baghouse, or replacing the activated carbon in an adsorber, may disqualify the emissions unit from a performance test until a sufficient amount of time has elapsed to ensure a test which will be representative of normal operations.)

E. Sample Train Calibration: All affected measuring and monitoring equipment should be calibrated within 60 days of the scheduled testing.

THE FOLLOWING ADDITIONAL INFORMATION SHALL BE SUBMITTED AS ATTACHMENTS:

F. Sample Train Information:

1. A schematic diagram of each sampling train.
2. The type or types of capture media to be used to collect each gas stream pollutant. (Include filter specification sheets)
3. Sample tube type, (e.g., glass, teflon, stainless steel, etc.)
4. Probe cleaning method and solvent to be used, if applicable.

1. See attached sample train diagram.
2. Type or types of capture media: M1: N/A M2: N/A M306: 0.1N NaOH M4: Samples are condensed in H2O and adsorbed onto Silica Gel.
3. Sample tube type: M1: N/A M2: N/A M4: borosilicate glass or stainless steel with connecting borosilicate glassware.
4 Probe cleaning method and solvent to be used: M1: N/A M2: N/A M306: Probe liner is rinsed using 0.1N NaOH as the reagent. It is not necessary to brush the probe liner. If a probe brush is used it must be non-metallic. M4: N/A

G. Laboratory Analysis:

A description of the laboratory analysis methods to be used to determine the concentration of each pollutant.
M1: N/A M2: N/A M306: Analysis for total chrome by graphite furnace atomic absorption spectroscopy (GFAAS). M4: A gas sample is extracted at a constant rate (or isokinetically in conjunction with other methods) from the source; moisture is removed from the sample stream and determined either volumetrically or gravimetrically.

H.

Description of Operations:

A description of any operation, process, or activity that could vent exhaust gases to the test stack. This shall include the description and feed rate of all materials capable of producing pollutant emissions used in each separate operation.

Note 1: All testing shall be performed at maximum rate capacity as specified by the equipment manufacturer or at the maximum rate actually used in the emissions unit operation, whichever is greater, or at any other rate specified by the administrator.

Note 2: If the emissions unit is not operated at maximum capacity, or as close as possible thereto, the emissions unit might be de-rated to that production capacity.

Note 3: Production records and parametric monitoring records must be included in the final report.
<u>The Hard Chrome Plating Tanks 7 – 11 (P001) are the only units vented through the scrubber to the exhaust.</u>

I. <u>Stack and Vent Description:</u>
A dimensional sketch or sketches showing the plan and elevation view of the entire ducting and stack arrangement. The sketch should include the relative position of all processes or operations venting to the stack or vent to be tested. It should also include the position of the ports relative to the nearest upstream and downstream gas flow disturbance or duct dimensional change. The sketches should include the relative position, type, and manufacturer's claimed efficiency of all gas cleaning equipment.

A cross sectional dimensional sketch of the stack or duct at the sampling ports, showing the position of sampling points. In case of a rectangular duct, show division of duct into equal areas.
<u>Please see the attached stack diagram.</u>

J. <u>Safety:</u>
Describe all possible safety hazards including such items as the presence of toxic fumes, high noise levels, areas where eye protection is required, etc. Note: Conditions considered unsafe at the time of the test will cause postponement.
<u>The Plant requires the use of safety glasses, safety shoes, hard hats, and hearing protection (in designated areas). At this time, and to the best of our belief and knowledge, there are no toxic fumes or other hazards expected to be on site at this facility that would cause you to formally prepare for your exposure to them. It is our recommendation however, to consult plant personnel regarding its safety policies before accessing the production areas on this site. Air Compliance Testing personnel will be required to wear safety shoes and safety glasses at all times while on site at the facility to comply with our own company policy.</u>

K. <u>Test Report:</u>
The final test report must contain, as a minimum, the following information to be acceptable:

All raw data sheets, including strip charts where applicable
Process data
Results of audit samples
All lab analyses data
All calibration data
Complete chain-of-custody records for all samples removed from the facility for recovery and/or analysis
All formulas used in calculating emission rates if different than specified in the applicable reference method
An explanation of all disruptions encountered during the test period, (i.e., Meter box changes, process shutdowns, broken glassware, etc.)
Backhalf analysis if determining particulate emissions that are 10 microns in aerodynamic diameter or less

Note: In accordance with OAC 3745-15-04 the report must be submitted within 30 days of conducting the test.
<u>The final test report will comply with all requirements in this ITT.</u>

L. <u>Test Postponement</u>
It is understandable that a test will need to be postponed due to circumstances that would not allow representative conditions to be established, such as recent maintenance or modification, equipment failure, or the absence of key personnel. However, concern that a test will result in a determination of non-compliance is not a valid reason for postponement, and a facility decision to postpone without a valid reason may result in enforcement action against the facility.

INTENT TO TEST NOTIFICATION (One Emissions Unit Per Sheet)

AGENCY USE ONLY
Date Received
No. Assigned

Facility Premise No. **1318005949**
Emissions Unit PTI No. **Title V**

Proposed Test Date **September 27, 2007**
SCC Code **30901018**

A. Facility Contact Information:

Name **BF Goodrich Plating**
Address **2800 E 33rd St, Cleveland OH 44115-3602**
Contact Person **Greg Goga**
Telephone Number (O) **216-429-4423** (Cell) **N/A**
E-Mail **greg.goga@goodrich.com**

Testing Firm Information:

Name **Air Compliance Testing, Inc.**
Address **PO Box 41156, Cleveland OH 44141-0156**
Contact Person **David B. Monro**
Telephone Number (O) **216 525-0900** (Cell) **440-821-7814**
E-Mail **davem@aircomp.com**

B. Test Location Information

Name **BF Goodrich Plating**
Address **2800 E. 33 St., Cleveland OH 44115**
Contact Person **Greg Goga**
Telephone Number (Office) **216-429-4423** (Cell) **N/A**

C. Test Plan and Emissions Unit Information Table: List the applicable information under each respective column heading.

Emission Unit	StackID	Test Location	Control Equipment	Monitoring Equipment	Pollutant(s) to be Tested	EPA Test Method	Audit Sample Available?	Number of Sampling Points	Total Time per Test Run (min)	Number of Sampling Runs
Hard Chrome Electroplating Tanks 1, 2B, and 2F (P001)	A	Scrubber Exhaust Stack	Scrubber	Pressure Drop	Stack Gas Velocity and Volumetric Flow Rate	1,2, and 4	No	Up to 24	120	3
Hard Chrome Electroplating Tanks 1, 2B, and 2F (P001)	A	Scrubber Exhaust Stack	Scrubber	Pressure Drop	Total Chromium	306	Yes	up to 24	120	3

Source is testing to comply with (check all that apply): **Title V Permit**

D. What is the maximum rated capacity? **10,825 amp-hr/hr**

Will Emissions Unit be operated at the maximum capacity given in its permit-to-install or permit-to-operate? **Yes [X] No [ ]**

Specify how the operating rate will be determined during testing? (*See notes 1, 2 and 3 on page 2.): **Normal facility recordkeeping procedures.**

Are any modifications to USEPA Reference Method(s) proposed? If "no", then no modification, however minor, will be accepted. If yes, list each test method and section being modified, and attach a detailed modification description and justification: **Yes [ ] No [X]**

Sampling Location(s): **Inlet [ ] Outlet [X] Simultaneous [ ]**

Will cyclonic flow check(s) be conducted? **Yes [X] No [ ] If potential to be physically possible exists.**

Fuel Sampling: **Coal-Proximate [ ] Ultimate [ ] Other [X] If other specify: N/A**

Emission Rate to be calculated using: **F-Factor [ ] Ultimate Coal Analysis [ ] Other [X] If other specify: As dictated by EPA Method 306 calculation algorithms**

Does the test method require audit samples? **Yes [X] No [ ]: Method 306**

Has any maintenance or parts replacement been performed on the emissions unit or the control equipment within the last year? **Yes [X] No [ ]: Normal routine maintenance**

(Note: Some maintenance, such as installing new filter bags in a baghouse, or replacing the activated carbon in an adsorber, may disqualify the emissions unit from a performance test until a sufficient amount of time has elapsed to ensure a test which will be representative of normal operations.)

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3. Sample tube type, (e.g., glass, teflon, stainless steel, etc.)
4. Probe cleaning method and solvent to be used, if applicable.

1. See attached sample train diagram.
2. Type or types of capture media: M1: N/A M2: N/A M306: 0.1N NaOH M4: Samples are condensed in H_2O and adsorbed onto Silica Gel.
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4. Probe cleaning method and solvent to be used: M1: N/A M2: N/A M306: Probe liner is rinsed using 0.1N NaOH as the reagent. It is not necessary to brush the probe liner. If a probe brush is used it must be non-metallic. M4: N/A

G. Laboratory Analysis:
A description of the laboratory analysis methods to be used to determine the concentration of each pollutant.
M1: N/A M2: N/A M306: Analysis for total chrome by graphite furnace atomic absorption spectroscopy (GFAAS). M4: A gas sample is extracted at a constant rate (or isokinetically in conjunction with other methods) from the source; moisture is removed from the sample stream and determined either volumetrically or gravimetrically.

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A description of any operation, process, or activity that could vent exhaust gases to the test stack. This shall include the description and feed rate of all materials capable of producing pollutant emissions used in each separate operation.

Note 1: All testing shall be performed at maximum rate capacity as specified by the equipment manufacturer or at the maximum rate actually used in the emissions unit operation, whichever is greater, or at any other rate specified by the administrator.

Note 2: If the emissions unit is not operated at maximum capacity, or as close as possible thereto, the emissions unit might be de-rated to that production capacity.

Note 3: Production records and parametric monitoring records must be included in the final report.

The Hard Chrome Electroplating Tanks 1, 2B, and 2F are the only unit vented through the scrubber to the exhaust.

I. Stack and Vent Description:

A dimensional sketch or sketches showing the plan and elevation view of the entire ducting and stack arrangement. The sketch should include the relative position of all processes or operations venting to the stack or vent to be tested. It should also include the position of the ports relative to the nearest upstream and downstream gas flow disturbance or duct dimensional change. The sketches should include the relative position, type, and manufacturer's claimed efficiency of all gas cleaning equipment.

A cross sectional dimensional sketch of the stack or duct at the sampling ports, showing the position of sampling points. In case of a rectangular duct, show division of duct into equal areas.
Please see attached stack diagram.

J. Safety:

Describe all possible safety hazards including such items as the presence of toxic fumes, high noise levels, areas where eye protection is required, etc. Note: Conditions considered unsafe at the time of the test will cause postponement.
The Plant requires the use of safety glasses, safety shoes, hard hats, and hearing protection (in designated areas). At this time, and to the best of our belief and knowledge, there are no toxic fumes or other hazards expected to be on site at this facility that would cause you to formally prepare for your exposure to them. It is our recommendation however, to consult plant personnel regarding its safety policies before accessing the production areas on this site. Air Compliance Testing personnel will be required to wear safety shoes and safety glasses at all times while on site at the facility to comply with our own company policy.

K. Test Report:

The final test report must contain, as a minimum, the following information to be acceptable:

All raw data sheets, including strip charts where applicable
Process data
Results of audit samples
All lab analyses data
All calibration data
Complete chain-of-custody records for all samples removed from the facility for recovery and/or analysis
All formulas used in calculating emission rates if different than specified in the applicable reference method
An explanation of all disruptions encountered during the test period, (i.e., Meter box changes, process shutdowns, broken glassware, etc.)
Back-half analysis, if determining particulate emissions that are 10 microns in aerodynamic diameter or less

Note: In accordance with OAC 3745-15-04 the report must be submitted within 30 days of conducting the test.
The final test report will comply with all requirements in this ITT.

L. Test Postponement

It is understandable that a test will need to be postponed due to circumstances that would not allow representative conditions to be established, such as recent maintenance or modification, equipment failure, or the absence of key personnel. However, concern that a test will result in a determination of non-compliance is not a valid reason for postponement, and a facility decision to postpone without a valid reason may result in enforcement action against the facility.

CLEVELAND DIVISION OF AIR QUALITY
FULL COMPLIANCE EVALUATION

REVISED: 05/12/2006

Ohio EPA

DAPC - APPENDIX N

FACILITY INFORMATION			
Facility Identification Number:	13-18-00-5949		
Facility Name:	Goodrich Landing Gear Division – Plating Operation		
Facility Address:	2800 East 33rd Street, Cleveland, Ohio, 44115		
Facility County:	Cuyahoga		
Mailing Address:	2800 East 33rd Street, Cleveland, Ohio, 44115		
Facility AFS Number (SCSC ID):	3903500554		
Facility SIC Code:	3471	**NAICS Code:**	332813

INSPECTION INFORMATION			
Date of Inspection:	1/25/2011	**Announced:**	Yes
Facility Arrival Time:	12:30 pm	**Departure Time:**	2:30 pm
Date of Previous Inspection:	8/25/2009	**Announced:**	Yes
Responsible Official:	Tom Butorac, Plant Manager		
Primary Facility Representative:	Stephanie Steinmetz, Environmental, Health, Safety Manager Jay Finegan, Environmental, Health, Safety Manager		
Representative Phone Number:	(216) 429-4423	**Fax Number:**	(216) 241-0577
Representative Email:	jay.finegan@goodrich.com Stephanie.steinmetz@goodrich.com		
Web Address:	www.goodrich.com		
Confidential Information:	No		
Required Safety Equipment:	Safety Glasses, Steel-Toe Boots		

FACILITY TYPE PERMIT AND POLLUTANTS			
Facility Type (G1-G4):	MegaSite $\boxed{\text{Title V Major}}$ Title V Area FEPTIO SMTV-PTI Minor/Other		
Federal Facility Type:	NSPS NESHAP $\boxed{\text{MACT}}$ PSD Emissions Offset SM-PTI		
Applicable MACT:	40 CFR 63 Subpart N	**Major or Area Source?**	Area
Applicable MACT:	40 CFR 63 Subpart T	**Major or Area Source?**	Major
Pollutants Regulated:	$\boxed{\text{PE}}$ Lead $\boxed{\text{OC}}$ $\boxed{\text{VOC}}$ CO NO_X SO_X $\boxed{\text{HAPs}}$ Air Toxics		
List HAPs:	Chromium, Trichloroethylene		

ATTAINMENT DESIGNATION						
PM_{10}	**$PM_{2.5}$**	**SO_2**	**Ozone (1hr)**	**Ozone(8hr)**	**CO**	**NO_x**
Attainment	Non-Attainment	Attainment	Attainment	Non-Attainment	Attainment	Attainment

Inspected By: Bryan Sokolowski **Date Report Completed:** February 9, 2011

Signature of Inspector: ____________________ **Date:** __________

Report Reviewed By: ____________________ **Date:** __________

Linda Kimmy, Field Enforcement Manager

INSPECTION SUMMARY

Goodrich Landing Gear Division – Plating Operation (Goodrich Landing Gear) performs chrome and nickel electroplating, and metal finishing for military and commercial landing gear.

On January 25, 2010, Cleveland Division of Air Quality (CDAQ) inspected Goodrich Landing Gear located at 2800 East 33rd Street, in Cleveland. Upon arrival CDAQ was greeted by Goodrich Landing Gear's Environmental Health and Safety Managers Stephanie Steinmetz and Jay Finegan. CDAQ performed a thorough walkthrough of the facility and verified all Emission Units (EUs). During the walkthrough CDAQ performed Method 9 – visible emission readings (Attachment #1) on EUs P002, and P003. CDAQ noticed no opacity violations during the tests. CDAQ also recorded the pressure drop of EU P002, and P003.

On September 24, 2010, Goodrich Landing Gear drained the solvent from EU L003: Open Top Tri-Chloroethylene Vapor Degeaser due to a leak. EU L003 has been out of operation since September 24, 2010. Goodrich Landing Gear plans on repairing and bringing EU L003 back into service. In the meantime Goodrich Landing Gear has used an alkaline cleaning dip tank for degreasing the parts.

EU P024 was incorrectly labeled in Stars2 and Anaximenes as 5 Grinders/Polishers. A Permit-to-Install (13-3417) was issued on August 17, 1998 for P024: Thermal Powder Coating System. EU P024 was never installed. CDAQ will shutdown EU P024, and assign the 5 Grinders/Polishers a EU ID number.

During the inspection CDAQ also verified the shutdown of several emission units.

Emission units Z002-Z005 will be renamed by Ynes Arocho due to the "Z" not being used anymore.

CDAQ is awaiting information on shot peen cabinets M111-M116. CDAQ wants to determine what EU ID number matches up with which company ID number.

Goodrich Landing Gear will receive a Letter of Warning for failing to measure the temperature of the primary condenser coil during the idling mode. Goodrich Landing Gear recording temperatures while the machine was in defrost mode. Temperature recording should only be taken during idling mode. This is in violation of Permit-to-Install #13-04323, Monitoring and/or Record Keeping Requirements (3).

The following individuals were present for the inspection:		
Jay Finegan	Env. Health, Safety Manager	Goodrich, Landing Gear Division
Stephanie Steinmetz	Env. Health, Safety Manager	Goodrich, Landing Gear Division
Sarah Buzas	Env. Compliance Specialist	Ohio EPA -- CDAQ
Ynes Arocho	Env. Compliance Specialist	Ohio EPA -- CDAQ
Bryan Sokolowski	Env. Enforcement Specialist	Ohio EPA -- CDAQ

ATTACHMENTS	
Attachment 1:	Method 9 Visible Emission Readings for EU P002, and P003
Attachment 2:	2010 Monthly Inspections
Attachment 3:	Weekly Freeboard Refrigeration Temperature Recordings
Attachment 4:	2010 Annual Vapor Degreaser Solvent Consumption Report
Attachment 5:	Preventative Maintenance Report

Attachment 6:	L003: Vapor Degreaser Specs.
Attachment 7:	Shot Peen Diagram
Attachment 8:	Withdrawal Form

FACILITY DETAIL	
Is the facility in compliance with the facility-wide operational, record keeping, and reporting requirements of permit terms and conditions?	No
For those facilities that have received a final Title V permit, was an Annual Certification of Compliance submitted as required by OAC 3745-77-03(C)(10) on or before April 30th?	Yes
Is the Annual Certification of Compliance correct?	Yes

HISTORICAL ENFORCEMENT INFORMATION	
Any enforcement action taken against the company within the last 5 years?	Yes
September 18, 2009, Goodrich Landing Gear received a Letter of Warning for failing to submit a quarterly deviation report. Letter of Warning follow-up letter was sent October 12, 2009.	

CURRENT COMPLIANCE INFORMATION	
Are there any violations discovered?	Yes
If violations were discovered, was the facility verbally warned?	No
After inspection correspondence (NOV, IFL, Verbal Warning, etc.)?	Letter of Warning
Goodrich Landing Gear has failed to measure the temperature of the primary condenser coil during the idling mode. Goodrich Landing Gear recording temperatures while the machine was in defrost mode. Temperature recording should only be taken during idling mode.	

EMISSIONS UNITS REQUIRING PERMIT(S) / NON-INSIGNIFICANT UNITS

Emissions Unit:	Description:
P001	Hard Chrome Electroplating Tanks (Tanks 1, 2B, 2F, and 7 with scrubber)
P002	Hard Chrome Electroplating Tanks (Tanks 8-11 with scrubber)

INSIGNIFICANT EMISSIONS UNITS (TITLE V ONLY)

Emissions Unit:	Description:	Reason:
K001	Paint Spray Booth for micro-mask stop-off and touch-up (298 gallons of EN Mask Green Paint used in 2010 combined for both Paint Spray booths)	OAC Rule 3745-77-01(V)(3)
P006	Wheelabrator Shot Peen with Panghorn Baghouse	OAC Rule 3745-77-01(V)(1)
P008	Three Nickel Sulfamate Plating Tanks	OAC Rule 3745-77-01(V)(1)
P009	Three Electroless Nickel Plating Tanks	OAC Rule 3745-77-01(V)(1)
P011	Aluminum Oxide Abrasive Blast Cleaning	OAC Rule 3745-77-01(V)(3)
P013	1.5 MMBTU/HR Lanley Embrittlement Relief Oven (Natural Gas Fired)	OAC Rule 3745-77-01(V)(1)
P015	Pangborn Shot Peen Machine #2	OAC Rule 3745-77-01(V)(3)

INSIGNIFICANT EMISSIONS UNITS (TITLE V ONLY)		
Emissions Unit:	Description:	Reason:
P016	Wheelabrator Shot Peen Cabinet #116	OAC Rule 3745-77-01(V)(3)
P017	Shot-blast Cabinets #112 and #113	OAC Rule 3745-77-01(V)(3)
P019	Abrasive Blast Cleaning using #80 AI02 Grit Blaster	OAC Rule 3745-77-01(V)(3)
P021	TICAD Cadmium Plating Tank	OAC Rule 3745-77-01(V)(1)
P022	Low Cadmium Plating Tank	OAC Rule 3745-77-01(V)(1)
P023	Lead Melting Operation	OAC Rule 3745-77-01(V)(1)
Z002 (Will be Renamed)	Peerless 0.63 MMBTU/HR Natural Gas Fired Boiler	OAC Rule 3745-77-01(V)(1)
Z003 (Will be Renamed)	0.69 MMBTU/HR Natural Gas Fired Boiler for vapor degreaser	OAC Rule 3745-77-01(V)(1)
Z004 (Will be Renamed)	0.019 MMBTU/HR Natural Gas Fired Boiler	OAC Rule 3745-77-01(V)(1)
Z005 (Will be Renamed)	500-Gallon Trichloroethylene Storage Tank	OAC Rule 3745-77-01(V)(1)
Unassigned	1.5 MMBTU/HR Lanley Embrittlement Relief Oven, Natural Gas Fired (new)	OAC Rule 3745-77-01(V)(1)
Unassigned	5 Polishers/Grinders	OAC Rule 3745-77-01(V)(1)
Unassigned	Paint Spray Booth for micro-mask stop-off and touch-up (298 gallons of EN Mask Green Paint used in 2010 combined for both Paint Spray booths)	OAC Rule 3745-77-01(V)(3)
Unassigned	Small Parts Cleaner using Xylene (165 gallons used 2010)	OAC Rule 3745-77-01(V)(1)
Unassigned	Shot Peen Cabinet #111, #114, #115	OAC Rule 3745-77-01

NON-OPERATIONAL SOURCES		
Emissions Unit:	Description:	Last Operational Date:
L003	Open Top Vapor Degreaser using Trichloroethylene (TCE)	September 24, 2010
P020	Cadmium Rinse/Plating Tank	January 25, 2011

SHUTDOWN SOURCES		
Emissions Unit:	Description:	Shutdown Date:
L002	Open Top Vapor Degreaser	2004
P003	Copper Plating Tank	2004
P004	Copper Stripping Tank	2004
P007	Glass Bead Peening Cabinet	2000
P018	Natural Gas Fired Embrittlement Oven	1994
P024	Thermal Powder Coating System	Never Installed
Z001	Natural Gas Fired Boiler	January 25, 2011

EMISSIONS UNIT (EU) DETAIL	
L003	Open Top Vapor Degreaser using Trichloroethylene (TCE)

Applicable Restrictions/Limitations	Restricted Category
OAC Rule 3745-31-05(A)(3)	Best Available Technology (BAT)
OAC Rule 3745-21-09(O)	Volatile Organic Compounds (VOCs)
40 CFR Part 63, Subpart T	Maximum Achievable Control Technology (MACT)

PERMIT STATUS		
PTI Number: 13-04323	**Date PTI issued:** 7/27/2004	**Date PTI app. submitted:** 2/20/2004
Installation: April 2004		
BAT: 14.2 TPY OC		
Date PTO issued: 7/31/2002	**Date PTO expires:** 7/31/2007	**Date PTO app. submitted:** 2/5/2007

CONTROL EQUIPMENT	
Is Air Pollution Control Equipment (APCE) required?	No
If YES, is the APCE required to be performance tested?	N/A
Were the required APCE reports submitted?	N/A
Are the required APCE reports adequate?	N/A
List APCE: None	

COMPLIANCE DATA	
Does this EU comply with applicable Monitoring, Record Keeping, and Reporting requirements?	No
Were VE Observations Performed? If not, why?	No, EU not in operation. EU has not operated since September 24, 2010.
Has the source been modified?	No
Is this emissions unit connected to other emissions units? If yes list EUs?	No
List process records required for review:	Records Required for Review: 1. Monthly Hoist Speed Monitoring (Attachment #2) 2. Weekly Freeboard Refrigeration Temperature Recordings (Attachment #3) 3. Wind Speed Records (Attachment #2) 4. Solvent Consumption (Attachment #4) 5. Lid Inspection (Attachment #2)
Monitored Operating Parameter (i.e. pressure drop, temperature, pH)	None
Were the required CEM/COM/CAM reports submitted?	N/A
Are the required CEM/COM/CAM reports adequate?	N/A

COMPLIANCE DATA	
Were the required deviation reports submitted?	Yes
Are the required deviation reports adequate?	Yes
Were any other required reports submitted?	Yes
Are any other required reports adequate?	Yes
List any other reports required:	Reports required for review: 1. Quarterly Deviation Report 2. Semiannual Deviation Report 3. TV Annual Compliance Certification 4. Annual Vapor Degreaser Report

EMISSIONS ESTIMATES				
Category	**Uncontrolled**	**Actual**	**Allowable**	**Potential to Emit**
OC	8.8 TPY*	8.8 TPY*	14.2 TPY	14.2 TPY
OC	0.022 lb/hr per ft^2**	0.022 lb/hr per ft^2**	0.045 lb/hr per ft^2	0.045 lb/hr per ft^2

Calculations / Equations:
N/A

Givens:
* From Annual Vapor Degreaser Report (Attachment #4) **Emission Test performed April 25-26, 2005

COMPLIANCE EVALUATION	
Compliance Determination:	Violation discovered, Goodrich Landing Gear has failed to measure the temperature of the primary condenser coil during the idling mode. Goodrich Landing Gear recording temperatures while the machine was in defrost mode. Temperature recording should only be taken during idling mode.
Comments:	EU L003 was not in operation at time of inspection. L003 sprang a leak in September 2010. The EU was drained and has not operated since September 24, 2010. Goodrich plans on repairing L003.

Inspector: Bryan Sokolowski **Date:** February 9, 2011

Reviewer: ______________________ **Date:** __________

EMISSIONS UNIT (EU) DETAIL	
P001	Hard Chrome Electroplating Tanks (Tanks 1, 2B, 2F and, 7 with scrubber)

Applicable Restrictions/Limitations	Restricted Category
OAC Rule 3745-17-07(A)(1)	Visible Emissions (VE)
OAC Rule 3745-17-11(B)	Particulate Emissions (PE)
40 CFR Part 63 Subpart N	MACT

PERMIT STATUS		
PTI Number: 13-712	**Date PTI Issued:** 1/29/1981	**Date PTI App Submitted:** 6/3/1980
Installation Date: 1980		**Modification Date:** 8/18/1992
BAT: N/A		
Date PTO Issued: 7/31/2002	**Date PTO Expires:** 7/31/2007	**Date PTO App Submitted:** 2/5/2007

CONTROL EQUIPMENT	
Is Air Pollution Control Equipment (APCE) required?	Yes
If YES, is the APCE required to be performance tested?	Yes
Were the required APCE reports submitted?	Yes
Are the required APCE reports adequate?	Yes
List APCE: Primary: Composite Mesh-Pad Filter System **Secondary:** Mist Eliminator	

COMPLIANCE DATA	
Does this EU comply with applicable Monitoring, Record Keeping, and Reporting requirements?	Yes
Were VE Observations Performed? If not, why?	Yes (Attachment #1)
Has the source been modified?	No
Is this emissions unit connected to other emissions units? If yes list EUs?	No
List process records required for review:	1. Preventative Maintenance Report (Attachment #5) 2. Daily Pressure Drop Readings (Observed checklist during inspection)
Monitored Operating Parameter (i.e. pressure drop, temperature, pH)	Pressure Drop
Were the required CEM/COM/CAM reports submitted?	N/A
Are the required CEM/COM/CAM reports adequate?	N/A
Were the required deviation reports submitted?	Yes
Are the required deviation reports adequate?	Yes
Were any other required reports submitted?	Yes
Are any other required reports adequate?	Yes
List any other reports required:	Reports required for review:

COMPLIANCE DATA	
	1. Quarterly Deviation Report 2. Semiannual Deviation Report 3. TV Annual Compliance Certification

EMISSIONS ESTIMATES				
Category	**Uncontrolled**	**Actual**	**Allowable**	**Potential to Emit**
Chromium (as mist)	0.0020 mg/dscm*	0.0020 mg/dscm*	0.015 mg/dscm	0.015 mg/dscm

OTHER LIMITATIONS:		
Category	**Actual**	**Allowable**
Visible Emissions (Opacity)	0% (Attachment #1)	20% opacity, as a 6-minute average
Pressure Drop (Composite Mesh-Pad System)	2.7 inches of H_2O	+/- 1 of 2.3 inches of H_2O

Givens:
*September 27, 2007 Stack Test

COMPLIANCE EVALUATION	
Compliance Determination:	No Violations Discovered
Comments:	None

Inspector: Bryan Sokolowski **Date:** February 9, 2011

Reviewer: ____________________ **Date:** __________

EMISSIONS UNIT (EU) DETAIL	
P002	Hard Chrome Electroplating Tanks (Tanks 8-11 with scrubber)

Applicable Restrictions/Limitations	Restricted Category
OAC Rule 3745-17-07(A)(1)	VE
OAC Rule 3745-17-11(B)	PE
40 CFR Part 63 Subpart N	MACT

PERMIT STATUS		
PTI Number: 13-712	**Date PTI Issued:** 1/29/1981	**Date PTI App Submitted:** 6/3/1980
Installation Date: 1980		**Modification Date:** 8/18/1992
BAT: N/A		
Date PTO Issued: 7/31/2002	**Date PTO Expires:** 7/31/2007	**Date PTO App Submitted:** 2/5/2007

CONTROL EQUIPMENT	
Is Air Pollution Control Equipment (APCE) required?	Yes
If YES, is the APCE required to be performance tested?	Yes
Were the required APCE reports submitted?	Yes
Are the required APCE reports adequate?	Yes
List APCE: Primary: Composite Mesh-Pad Filter System **Secondary:** Mist Eliminator	

COMPLIANCE DATA	
Does this EU comply with applicable Monitoring, Record Keeping, and Reporting requirements?	Yes
Were VE Observations Performed? If not, why?	Yes (Attachment #1)
Has the source been modified?	No
Is this emissions unit connected to other emissions units? If yes list EUs?	No
List process records required for review:	1. Preventative Maintenance Report (Attachment #5) 2. Daily Pressure Drop Readings (Observed checklist during inspection)
Monitored Operating Parameter (i.e. pressure drop, temperature, pH)	Pressure Drop
Were the required CEM/COM/CAM reports submitted?	N/A
Are the required CEM/COM/CAM reports adequate?	N/A
Were the required deviation reportssubmitted?	Yes
Are the required deviation reports adequate?	Yes
Were any other required reports submitted?	Yes
Are any other required reports adequate?	Yes

COMPLIANCE DATA	
List any other reports required:	Reports required for review: 1. Quarterly Deviation Report 2. Semiannual Deviation Report 3. TV Annual Compliance Certification

EMISSIONS ESTIMATES				
Category	**Uncontrolled**	**Actual**	**Allowable**	**Potential to Emit**
Chromium (as mist)	0.0024 mg/dscm*	0.0024 mg/dscm*	0.015 mg/dscm	0.015 mg/dscm

OTHER LIMITATIONS:		
Category	**Actual**	**Allowable**
Visible Emissions (Opacity)	0% (Attachment #1)	20% opacity, as a 6-minute average
Pressure Drop (Composite Mesh-Pad System)	2.6 inches of H_2O	+/- 1 of 2.3 inches of H_2O

Givens:
*September 27, 2007 Stack Test

COMPLIANCE EVALUATION	
Compliance Determination:	No Violations Discovered
Comments:	None

Inspector: Bryan Sokolowski **Date:** February 9, 2011

Reviewer: ______________________________ **Date:** _________

Goodrich Corporation **Facility ID: 1318005949**
Landing Gear Plating Operation
2800 East 33rd Street
Cleveland, OH 44115

2011 Semi-annual Deviation/Compliance Report #2
Halogenated Solvent Cleaning Machine (EU ID: L003)

Reporting Period: July 1, 2011– December 31, 2011

Description of Process

Goodrich Plating Operations, located at 2800 East 33rd Street in Cleveland, Ohio, operates a vapor degreaser using Trichloroethylene. Landing gear parts are placed into the degreaser for cleaning.

Recordkeeping/Reporting Requirements for Maintaining Compliance

RECORDKEEPING REQUIREMENTS			
ID	**Brief Description**	**Frequency**	**Comments**
1	Emissions Control	Continuous	• Results of control device monitoring; • Information on actions taken to comply with 40 CFR 63.463 (monitoring of control devices and batch vapor or in-line solvent cleaning machines);
2	Initial Performance	One time	• Maintain records for an initial monitoring test of wind speed and room parameters; • Maintain owner's manuals or written maintenance and operating procedures for the solvent cleaning machine and control equipment; • Record the date of installation for the solvent cleaning machine and all of its control devices; • Records of the halogenated HAP solvent content for the solvent used in the solvent cleaning machine.
3	Freeboard Refrigeration	Weekly	• Records for the monitoring of the freeboard refrigeration device;
4	Operating Environment	Quarterly	• Monitor and record room wind speed;

REPORTING REQUIREMENTS			
ID	**Brief Description**	**Frequency**	**Comments**
1	Initial Notice	One time	• Initial statement of compliance.
2	Deviation Reports – Operational Requirements	Quarterly	• Exceedance reports for the condenser coil temperature; • Deviation reports that document violations of emission limitations, operational restrictions, and control device operating parameter limitations.
3	Deviation Reports – Recordkeeping/Reporting	Semi-annually	• Deviation reports that document violations of federally enforceable monitoring, record keeping, and reporting requirements;
4	Compliance Certification	Annually	• Annual report with certification once per year.

Idling Emission Test

A new vapor degreaser was installed in January, 2005. The facility conducted an idling emission test and submitted an initial statement of compliance report in May, 2005.

Goodrich Corporation
Landing Gear Plating Operation
2800 East 33rd Street
Cleveland, OH 44115

Facility ID: 1318005949

2011 Semi-annual Deviation/Compliance Report #2
Halogenated Solvent Cleaning Machine (EU ID: L003)

Reporting Period: July 1, 2011– December 31, 2011

Description of Changes in System since last Report

The vapor degreaser was placed out of operation on September 24, 2010, and drained of TCE. Repairs to the system began in Q2, 2011, and were completed in Q3, 2011. Upon completion of the repairs on September 16. 2011, the vapor degreaser was physically capable of being operated. However, we were required to prepare a series of test panels for customer approval before we could release the system for use on actual product. Consequently, the system was not officially released until 11/15/11. The new electronic data-logging system for capturing temperature is installed, but not yet wired into the system.

Deviations during Reporting Period;

The following deviations from requirements (see table above) occurred during this reporting period:

Item	Date	Deviation
1	Oct, 2011	Hoist speed, which is required to be measured monthly, was not measured (two hoists)

Comments and corrections:

Item	Comments and Corrections
1	This measurement was simply overlooked. First, the two hoists have been electromechanically modified so that they are incapable of exceeding 11 fpm. Second, all measurements before and after the missing observations confirm that the hoists operate around 8.2 fpm, much less than the maximum value of 11 fpm.

Goodrich Corporation
Landing Gear Plating Operation
2800 East 33rd Street
Cleveland, OH 44115

Facility ID: 1318005949

2011 Semi-annual Deviation/Compliance Report #2
Hard Chromium Electroplating Operations

Reporting Period: July 1, 2011– December 31, 2011

Description of Process

Goodrich Corporation Plating Operations operates two (2) chrome electro-plating lines. Chrome and particulate emissions are controlled by two composite mesh-pad systems. The first chrome plating line has five (5) leads or hoods which draw emissions from four (4) hard chrome plating tanks and three (3) strip tanks with emissions controlled by the South Scrubber System. The second chrome plating line encompasses four chrome plating tanks controlled by the North Scrubber System. Goodrich uses both of these lines to conduct chrome plating operations for manufactured landing gears.

Record Keeping/Reporting Requirements for Maintaining Compliance

RECORDKEEPING REQUIREMENTS			
ID	**Brief Description**	**Frequency**	**Comments**
1	Emissions Control	Continuous	• Maintain inspection records for add-on pollution control devices (if any); • Maintain records of all maintenance performed on the emissions unit; • Maintain records of all malfunctions and actions taken to correct malfunctions; • Maintain records (i.e. checklists) that demonstrate compliance with the O&M plan; • Maintain records of the results of all performance tests, including conductions of the tests; • Maintain records of monitoring data that are used to determine compliance with the standards within the permit; • Identify all periods of excess emissions;
2	Pressure Drop	Daily	• Record the pressure drop across the composite mesh-pad system.

REPORTING REQUIREMENTS			
ID	**Brief Description**	**Frequency**	**Comments**
1	Notification of Reconstruction	Continuous	• Notification of reconstruction with required information any time a reconstruction will occur.
2	Initial Notifications	On-Time	• Initial Notification report; • Initial Notification of Compliance Status.
3	Deviation Reports – Operational	Quarterly	• The ongoing compliance status report; • Deviation reports that document violations of emission limitations, operational restrictions, and control device operating parameter limitations;
4	Deviation Reports – Recordkeeping/Reporting	Semi-annual	• Deviation reports that document violations of federally enforceable monitoring, record keeping, and reporting requirements;
5	Certificate of Compliance	Annual	• Certificate of Compliance

Goodrich Corporation
Landing Gear Plating Operation
2800 East 33rd Street
Cleveland, OH 44115

Facility ID: 1318005949

2011 Semi-annual Deviation/Compliance Report #2
Hard Chromium Electroplating Operations

Reporting Period: July 1, 2011– December 31, 2011

Description of Changes in System since last Report

While there have been no changes to the north or south scrubber units as of the previous report, all but one of the hard chrome plating tanks exhausted by the south scrubber unit have been taken out of service. Two of the plating tanks have been converted to strip tanks; the other two plating tanks are currently empty. We are investigating re-ducting the two scrubber units so that either of them will support all remaining hard chrome plating tanks. This parallel structure would allow us to generally shut down one of the scrubber units, but leave us with a back-up exhaust system should we experience system failure of the then operating system or need to conduct repairs or maintenance.

Deviations during Reporting Period:

The following deviations from requirements (see table above) occurred during this reporting period:

Item	Date	EU ID	Deviation
			NO DEVIATIONS REPORTED

Comments and corrections:

Item	Comments and Corrections

Goodrich Corporation
Landing Gear Plating Operation
2800 East 33rd Street
Cleveland, OH 44115

Facility ID: 1318005949

2011 Quarterly Deviation/Exceedance Report (Q4)
Halogenated Solvent Cleaning Machine (EU ID: L003)

Reporting Period: October 1, 2011– December 31, 2011 **Time of System:** 24 hours/7 days

Description of Process

Goodrich Plating Operations, located at 2800 East 33rd Street in Cleveland, Ohio, operates a vapor degreaser using Trichloroethylene. Landing gear parts are placed into the degreaser for cleaning.

Control Equipment for Maintaining Compliance

The following as prescribed in 40 CFR 63.468(d):

Control Equipment	*Frequency*	*Parameters*
[1] Electric Cover	Monthly	Opens/closes properly & is free from cracks, holes and defects.
[2] Hoist	Quarterly	The hoist is mechanically incapable of speeds greater than 11 ft/min.
[3] Environment	Monthly	Ensure wind speed is no greater than 0 (zero) ft/min.
[4] Freeboard Refrigeration Device	Weekly	Temperature is required to be equal or less than minus 5 degrees Fahrenheit.

Idling Emission Test
A new vapor degreaser was installed in January, 2005. The facility conducted an idling emission test and submitted an initial statement of compliance report in May, 2005.

Description of Changes in System since last Report

The vapor degreaser was placed out of operation on September 24, 2010, and drained of TCE. Repairs to the system began in Q2, 2011, and were completed in Q3, 2011. Upon completion of the repairs on September 16. 2011, the vapor degreaser was physically capable of being operated. However, we were required to prepare a series of test panels for customer approval before we could release the system for use on actual product. Consequently, the system was not officially released until 11/15/11. The new electronic data-logging system for capturing temperature is installed, but not yet wired into the system.

Exceedances and Deviations during Reporting Period;

The following observations that exceed or deviate from permit terms and conditions were recorded during this reporting period:

Item	Date	Parameter	Requirement	Observation
		NO DEVIATIONS REPORTED		

Comments and corrections:

Item	Comments and Corrections

Goodrich Corporation
Landing Gear Plating Operation
2800 East 33rd Street
Cleveland, OH 44115

Facility ID: 1318005949

2011 Quarterly Deviation/Exceedance Report (Q4)
Hard Chromium Electroplating Operations

Reporting Period: October 1, 2011– December 31, 2011 **Time of System:** 24 hours/7 days

Description of Process

Goodrich Corporation Plating Operations operates two (2) chrome electro-plating lines. Chrome and particulate emissions are controlled by two composite mesh-pad systems. The first chrome plating line has five (5) leads or hoods which draw emissions from four (4) hard chrome plating tanks and three (3) strip tanks with emissions controlled by the South Scrubber System. The second chrome plating line encompasses four chrome plating tanks controlled by the North Scrubber System. Goodrich uses both of these lines to conduct chrome plating operations for manufactured landing gears.

Operating Parameters for Compliance

Pressure drop across the systems will be monitored once each day that any effected source is operating. Pressure drop will be maintained within +/- one inch of water column as prescribed in 40 CFR 63.344(C)(l)(ii).

	South Scrubber (Line #1)	*North Scrubber (Line #2)*
Emission Limitations	0.015 mg/dscm	0.015 mg/dscm
Pressure Drop Ranges for Compliance (+/- 1 in-H_20)	2.3 (in-H_20)	2.3 (in-H_20)

Operating Parameters for Excess Emission Releases

Total Duration of Excess Emissions:	*South Scrubber (Line #1)*	*North Scrubber (Line #2)*
[1] As a % of time within the period	-0-	-0-
[2] Due to Process Upsets	-0-	-0-
[3] Due to Control Equipment Malfunctions	-0-	-0-
[4] Due to other known causes	-0-	-0-
[5] Due to other unknown causes	-0-	-0-

Description of Changes in System Since last Report

There have been no changes to the north or south scrubber units as of the previous report.

Goodrich Corporation
Landing Gear Plating Operation
2800 East 33rd Street
Cleveland, OH 44115

Facility ID: 1318005949

2011 Quarterly Deviation/Exceedance Report (Q4)
Hard Chromium Electroplating Operations

Reporting Period: October 1, 2011– December 31, 2011 **Time of System:** 24 hours/7 days

Exceedances and Deviations during Reporting Period:

The following observations that exceed or deviate from permit terms and conditions were recorded during this reporting period:

Item	Date	Parameter	Requirement	Observation
		NO DEVIATIONS REPORTED		

Comments and corrections:

Item	Comments and Corrections

10/1/11 4:00:48 AM Pressure at location Chrome North Scrubber is 2.18 inch of water
10/1/11 5:30:48 AM Pressure at location Chrome South Scrubber is 2.64 inch of water
10/1/11 9:00:21 AM Pressure at location Chrome North Scrubber is 2.26 inch of water
10/1/11 11:15:21 AM Pressure at location Chrome South Scrubber is 3.08 inch of water
10/1/11 1:30:21 PM Pressure at location Chrome North Scrubber is 2.29 inch of water
10/1/11 3:45:20 PM Pressure at location Chrome South Scrubber is 3.07 inch of water
10/1/11 6:00:20 PM Pressure at location Chrome North Scrubber is 2.21 inch of water
10/1/11 8:30:19 PM Pressure at location Chrome South Scrubber is 2.98 inch of water
10/1/11 11:00:19 PM Pressure at location Chrome North Scrubber is 2.22 inch of water
10/2/11 4:00:18 AM Pressure at location Chrome North Scrubber is 2.27 inch of water
10/2/11 5:30:18 AM Pressure at location Chrome South Scrubber is 2.90 inch of water
10/2/11 9:00:17 AM Pressure at location Chrome North Scrubber is 2.27 inch of water
10/2/11 11:15:17 AM Pressure at location Chrome South Scrubber is 2.92 inch of water
10/2/11 1:30:16 PM Pressure at location Chrome North Scrubber is 2.31 inch of water
10/2/11 3:45:16 PM Pressure at location Chrome South Scrubber is 2.95 inch of water
10/2/11 6:00:16 PM Pressure at location Chrome North Scrubber is 2.26 inch of water
10/2/11 8:30:15 PM Pressure at location Chrome South Scrubber is 3.02 inch of water
10/2/11 11:00:15 PM Pressure at location Chrome North Scrubber is 2.04 inch of water
10/3/11 4:00:14 AM Pressure at location Chrome North Scrubber is 2.18 inch of water
10/3/11 5:30:14 AM Pressure at location Chrome South Scrubber is 2.95 inch of water
10/3/11 9:00:13 AM Pressure at location Chrome North Scrubber is 2.20 inch of water
10/3/11 11:15:13 AM Pressure at location Chrome South Scrubber is 2.87 inch of water
10/3/11 1:30:13 PM Pressure at location Chrome North Scrubber is 2.19 inch of water
10/3/11 3:45:12 PM Pressure at location Chrome South Scrubber is 2.90 inch of water
10/3/11 6:00:12 PM Pressure at location Chrome North Scrubber is 2.20 inch of water
10/3/11 8:30:12 PM Pressure at location Chrome South Scrubber is 3.17 inch of water
10/3/11 11:00:11 PM Pressure at location Chrome North Scrubber is 2.18 inch of water
10/4/11 4:00:10 AM Pressure at location Chrome North Scrubber is 2.23 inch of water
10/4/11 5:30:10 AM Pressure at location Chrome South Scrubber is 2.79 inch of water
10/4/11 9:00:10 AM Pressure at location Chrome North Scrubber is 2.06 inch of water
10/4/11 11:15:09 AM Pressure at location Chrome South Scrubber is 2.98 inch of water
10/4/11 1:30:09 PM Pressure at location Chrome North Scrubber is 2.20 inch of

water
10/4/11 3:45:09 PM   Pressure at location Chrome South Scrubber is 2.97 inch of water
10/4/11 6:00:08 PM   Pressure at location Chrome North Scrubber is 2.25 inch of water
10/4/11 8:30:08 PM   Pressure at location Chrome South Scrubber is 2.99 inch of water
10/4/11 11:00:07 PM   Pressure at location Chrome North Scrubber is 2.28 inch of water
10/5/11 4:00:07 AM   Pressure at location Chrome North Scrubber is 2.38 inch of water
10/5/11 5:30:07 AM   Pressure at location Chrome South Scrubber is 2.98 inch of water
10/5/11 9:00:06 AM   Pressure at location Chrome North Scrubber is 2.28 inch of water
10/5/11 11:15:06 AM   Pressure at location Chrome South Scrubber is 2.79 inch of water
10/5/11 1:30:05 PM   Pressure at location Chrome North Scrubber is 2.22 inch of water
10/5/11 3:45:05 PM   Pressure at location Chrome South Scrubber is 2.91 inch of water
10/5/11 6:00:04 PM   Pressure at location Chrome North Scrubber is 2.09 inch of water
10/5/11 8:30:04 PM   Pressure at location Chrome South Scrubber is 3.10 inch of water
10/5/11 11:00:03 PM   Pressure at location Chrome North Scrubber is 2.28 inch of water
10/6/11 4:00:03 AM   Pressure at location Chrome North Scrubber is 2.28 inch of water
10/6/11 5:30:02 AM   Pressure at location Chrome South Scrubber is 2.89 inch of water
10/6/11 9:00:02 AM   Pressure at location Chrome North Scrubber is 2.21 inch of water
10/6/11 11:15:01 AM   Pressure at location Chrome South Scrubber is 2.91 inch of water
10/6/11 1:30:01 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
10/6/11 3:45:01 PM   Pressure at location Chrome South Scrubber is 2.96 inch of water
10/6/11 6:00:00 PM   Pressure at location Chrome North Scrubber is 2.20 inch of water
10/6/11 8:30:00 PM   Pressure at location Chrome South Scrubber is 3.07 inch of water
10/6/11 11:00:59 PM   Pressure at location Chrome North Scrubber is 2.33 inch of water
10/7/11 4:00:59 AM   Pressure at location Chrome North Scrubber is 2.42 inch of water
10/7/11 5:30:58 AM   Pressure at location Chrome South Scrubber is 3.09 inch of water
10/7/11 9:00:58 AM   Pressure at location Chrome North Scrubber is 2.15 inch of water
10/7/11 11:15:57 AM   Pressure at location Chrome South Scrubber is 2.80 inch of water
10/7/11 1:30:57 PM   Pressure at location Chrome North Scrubber is 2.26 inch of water
10/7/11 3:45:57 PM   Pressure at location Chrome South Scrubber is 2.89 inch of water
10/7/11 6:00:56 PM   Pressure at location Chrome North Scrubber is 2.21 inch of water
10/7/11 8:30:56 PM   Pressure at location Chrome South Scrubber is 2.99 inch of water
10/7/11 11:00:55 PM   Pressure at location Chrome North Scrubber is 2.44 inch of water

10/8/11 4:00:54 AM Pressure at location Chrome North Scrubber is 2.37 inch of water
10/8/11 5:30:54 AM Pressure at location Chrome South Scrubber is 2.94 inch of water
10/8/11 9:00:54 AM Pressure at location Chrome North Scrubber is 2.35 inch of water
10/8/11 11:15:53 AM Pressure at location Chrome South Scrubber is 2.93 inch of water
10/8/11 1:30:53 PM Pressure at location Chrome North Scrubber is 2.22 inch of water
10/8/11 3:45:53 PM Pressure at location Chrome South Scrubber is 2.80 inch of water
10/8/11 6:00:52 PM Pressure at location Chrome North Scrubber is 2.13 inch of water
10/8/11 8:30:52 PM Pressure at location Chrome South Scrubber is 2.89 inch of water
10/8/11 11:00:51 PM Pressure at location Chrome North Scrubber is 2.31 inch of water
10/9/11 4:00:50 AM Pressure at location Chrome North Scrubber is 2.27 inch of water
10/9/11 5:30:50 AM Pressure at location Chrome South Scrubber is 2.89 inch of water
10/9/11 9:00:49 AM Pressure at location Chrome North Scrubber is 2.26 inch of water
10/9/11 11:15:49 AM Pressure at location Chrome South Scrubber is 2.93 inch of water
10/9/11 1:30:48 PM Pressure at location Chrome North Scrubber is 2.27 inch of water
10/9/11 3:45:48 PM Pressure at location Chrome South Scrubber is 2.96 inch of water
10/9/11 6:00:47 PM Pressure at location Chrome North Scrubber is 2.25 inch of water
10/9/11 8:30:47 PM Pressure at location Chrome South Scrubber is 2.89 inch of water
10/9/11 11:00:47 PM Pressure at location Chrome North Scrubber is 2.15 inch of water
10/10/11 4:00:46 AM Pressure at location Chrome North Scrubber is 2.22 inch of water
10/10/11 5:30:45 AM Pressure at location Chrome South Scrubber is 2.93 inch of water
10/10/11 9:00:45 AM Pressure at location Chrome North Scrubber is 2.28 inch of water
10/10/11 11:15:44 AM Pressure at location Chrome South Scrubber is 2.87 inch of water
10/10/11 1:30:44 PM Pressure at location Chrome North Scrubber is 2.35 inch of water
10/10/11 3:45:44 PM Pressure at location Chrome South Scrubber is 2.93 inch of water
10/10/11 6:00:43 PM Pressure at location Chrome North Scrubber is 2.35 inch of water
10/10/11 8:30:43 PM Pressure at location Chrome South Scrubber is 3.06 inch of water
10/10/11 11:00:43 PM Pressure at location Chrome North Scrubber is 2.22 inch of water
10/11/11 4:00:42 AM Pressure at location Chrome North Scrubber is 2.29 inch of water
10/11/11 5:30:42 AM Pressure at location Chrome South Scrubber is 2.90 inch of water
10/11/11 9:00:41 AM Pressure at location Chrome North Scrubber is 2.22 inch of water
10/11/11 11:15:41 AM Pressure at location Chrome South Scrubber is 2.88 inch of water
10/11/11 1:30:40 PM Pressure at location Chrome North Scrubber is 2.20 inch of

water
10/11/11 3:45:40 PM   Pressure at location Chrome South Scrubber is 2.70 inch of water
10/11/11 6:00:39 PM   Pressure at location Chrome North Scrubber is 2.25 inch of water
10/11/11 8:30:39 PM   Pressure at location Chrome South Scrubber is 2.79 inch of water
10/11/11 11:00:38 PM   Pressure at location Chrome North Scrubber is 2.17 inch of water
10/12/11 4:00:38 AM   Pressure at location Chrome North Scrubber is 2.19 inch of water
10/12/11 5:30:37 AM   Pressure at location Chrome South Scrubber is 2.57 inch of water
10/12/11 9:00:37 AM   Pressure at location Chrome North Scrubber is 2.22 inch of water
10/12/11 11:15:37 AM   Pressure at location Chrome South Scrubber is 2.91 inch of water
10/12/11 1:30:36 PM   Pressure at location Chrome North Scrubber is 2.40 inch of water
10/12/11 3:45:36 PM   Pressure at location Chrome South Scrubber is 2.97 inch of water
10/13/11 4:00:38 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
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12/12/11 5:30:38 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/12/11 9:00:38 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/12/11 11:15:37 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/12/11 1:30:37 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/12/11 3:45:36 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/12/11 6:00:36 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/12/11 8:30:36 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/12/11 11:00:35 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/13/11 4:00:34 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/13/11 5:30:34 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/13/11 9:00:34 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/13/11 11:15:33 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/13/11 1:30:33 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/13/11 3:45:33 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/13/11 6:00:32 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/13/11 8:30:32 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/13/11 11:00:31 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/14/11 4:00:31 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/14/11 5:30:30 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/14/11 9:00:30 AM   Pressure at location Chrome North Scrubber is 2.18 inch of

water
12/14/11 11:15:29 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/14/11 1:30:29 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/14/11 3:45:29 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/14/11 6:00:28 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/14/11 8:30:28 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/14/11 11:00:27 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/15/11 4:00:26 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/15/11 5:30:26 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/15/11 9:00:26 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/15/11 11:15:25 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/15/11 1:30:25 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/15/11 3:45:24 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/15/11 6:00:24 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/15/11 8:30:24 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/15/11 11:00:23 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/16/11 4:00:22 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/16/11 5:30:22 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/16/11 9:00:21 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/16/11 11:15:21 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/16/11 1:30:21 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/16/11 3:45:20 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/16/11 6:00:20 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/16/11 8:30:20 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/16/11 11:00:19 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/17/11 4:00:19 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/17/11 5:30:18 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/17/11 9:00:18 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/17/11 11:15:17 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/17/11 1:30:17 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/17/11 3:45:17 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/17/11 6:00:16 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water

12/17/11 8:30:16 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/17/11 11:00:15 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/18/11 4:00:14 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/18/11 5:30:14 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/18/11 9:00:14 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/18/11 11:15:13 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/18/11 1:30:13 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/18/11 3:45:13 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/18/11 6:00:12 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/18/11 8:30:12 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/18/11 11:00:11 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/19/11 4:00:10 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/19/11 5:30:10 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/19/11 9:00:10 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/19/11 11:15:09 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/19/11 1:30:09 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/19/11 3:45:09 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/19/11 6:00:08 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/19/11 8:30:08 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/19/11 11:00:08 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/20/11 4:00:07 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/20/11 5:30:07 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/20/11 9:00:06 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/20/11 11:15:06 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/20/11 1:30:05 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/20/11 3:45:05 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/20/11 6:00:05 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/20/11 8:30:04 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/20/11 11:00:04 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/21/11 4:00:03 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/21/11 5:30:03 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/21/11 9:00:02 AM   Pressure at location Chrome North Scrubber is 2.18 inch of

water
12/21/11 11:15:02 AM Pressure at location Chrome South Scrubber is 2.87 inch of water
12/21/11 1:30:02 PM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/21/11 3:45:01 PM Pressure at location Chrome South Scrubber is 2.87 inch of water
12/21/11 6:00:01 PM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/21/11 8:30:00 PM Pressure at location Chrome South Scrubber is 2.87 inch of water
12/21/11 11:00:00 PM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/22/11 4:00:59 AM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/22/11 5:30:59 AM Pressure at location Chrome South Scrubber is 2.87 inch of water
12/22/11 9:00:58 AM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/22/11 11:15:58 AM Pressure at location Chrome South Scrubber is 2.87 inch of water
12/22/11 1:30:58 PM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/22/11 3:45:57 PM Pressure at location Chrome South Scrubber is 2.87 inch of water
12/22/11 6:00:57 PM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/22/11 8:30:56 PM Pressure at location Chrome South Scrubber is 2.87 inch of water
12/22/11 11:00:56 PM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/23/11 4:00:55 AM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/23/11 5:30:55 AM Pressure at location Chrome South Scrubber is 2.87 inch of water
12/23/11 9:00:54 AM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/23/11 11:15:54 AM Pressure at location Chrome South Scrubber is 2.87 inch of water
12/23/11 1:30:53 PM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/23/11 3:45:53 PM Pressure at location Chrome South Scrubber is 2.87 inch of water
12/23/11 6:00:52 PM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/23/11 8:30:52 PM Pressure at location Chrome South Scrubber is 2.87 inch of water
12/23/11 11:00:52 PM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/24/11 4:00:51 AM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/24/11 5:30:50 AM Pressure at location Chrome South Scrubber is 2.87 inch of water
12/24/11 9:00:50 AM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/24/11 11:15:50 AM Pressure at location Chrome South Scrubber is 2.87 inch of water
12/24/11 1:30:49 PM Pressure at location Chrome North Scrubber is 2.18 inch of water
12/24/11 3:45:49 PM Pressure at location Chrome South Scrubber is 2.87 inch of water
12/24/11 6:00:49 PM Pressure at location Chrome North Scrubber is 2.18 inch of water

12/24/11 8:30:48 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/24/11 11:00:48 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/25/11 4:00:47 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/25/11 5:30:47 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/25/11 9:00:47 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/25/11 11:15:46 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/25/11 1:30:46 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/25/11 3:45:46 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/25/11 6:00:45 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/25/11 8:30:45 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/25/11 11:00:44 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/26/11 4:00:44 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/26/11 5:30:43 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/26/11 9:00:43 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/26/11 11:15:42 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/26/11 1:30:42 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/26/11 3:45:41 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/26/11 6:00:41 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/26/11 8:30:41 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/26/11 11:00:40 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/27/11 4:00:39 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/27/11 5:30:39 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/27/11 9:00:38 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/27/11 11:15:38 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/27/11 1:30:38 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/27/11 3:45:37 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/27/11 6:00:37 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/27/11 8:30:36 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/27/11 11:00:36 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/28/11 4:00:35 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/28/11 5:30:35 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/28/11 9:00:34 AM   Pressure at location Chrome North Scrubber is 2.18 inch of

water
12/28/11 11:15:34 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/28/11 1:30:34 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/28/11 3:45:33 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/28/11 6:00:33 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/28/11 8:30:32 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/28/11 11:00:32 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/29/11 4:00:31 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/29/11 5:30:31 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/29/11 9:00:30 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/29/11 11:15:30 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/29/11 1:30:30 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/29/11 3:45:29 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/29/11 6:00:29 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/29/11 8:30:28 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/29/11 11:00:28 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/30/11 4:00:27 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/30/11 5:30:27 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/30/11 9:00:26 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/30/11 11:15:26 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/30/11 1:30:26 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/30/11 3:45:25 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/30/11 6:00:25 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/30/11 8:30:24 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/30/11 11:00:24 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/31/11 4:00:23 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/31/11 5:30:23 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/31/11 9:00:22 AM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/31/11 11:15:22 AM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/31/11 1:30:21 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water
12/31/11 3:45:21 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/31/11 6:00:21 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water

12/31/11 8:30:20 PM   Pressure at location Chrome South Scrubber is 2.87 inch of water
12/31/11 11:00:20 PM   Pressure at location Chrome North Scrubber is 2.18 inch of water

Emissions Report Summary

Reports Included **FER:** ☑ **ES:** ☐ **EIS:** ☑ **EIS Status** Submitted **Reporting Level:** Emissions Unit(s) operated in 2010

Facility Emissions

Criteria Air Pollutant			$	Emissions Reported			
Pollutant	**Code**		**$**	**Fugitive Amount**	**Stack Amount**	**Total**	**Units**
PE (Cond) - Primary PM Condensible Portion Only (All Less than 1 Micron)	PM-CON	Locate		0.	0.	0.	TONs
SO2 - Sulfur Dioxide	SO2	Locate	✓	0.	0.	0.	TONs
NOx - Nitrogen Oxides	NOX	Locate	✓	0.	0.	0.	TONs
Organic Compounds	OC	Locate	✓	10.87	0.	10.87	TONs
Pb - Lead	7439921	Locate	✓	0.	0.	0.	TONs
PE (Filt) - Primary PM, Filterable Portion Only	PM-FIL	Locate	✓	0.	0.005205	0.005205	TONs
PM10 (Filt) - Primary PM10, Filterable Portion Only	PM10-FIL	Locate		0.	0.005205	0.005205	TONs
PM2.5 (FILT) - Primary PM2.5, Filterable Portion Only	PM25-FIL	Locate		0.	0.004945	0.004945	TONs
VOC - Volatile Organic Compounds	VOC	Locate		10.87	0.	10.87	TONs
Ammonia	NH3	Locate		0.	0.	0.	TONs
CO - Carbon Monoxide	CO	Locate		0.	0.	0.	TONs

Printable view Export to excel **Total Chargeable FER Pollutants: 10.8752 Tons**

The following information was developed using Ohio EPA-generated pollutant emission calculations. The values may be provided to USEPA by Ohio EPA as part of Ohio EPA's federal grant commitments. You may modify these pollutant emission calculations, at the process level, if you have more accurate information. There is no certification of these values as part of the emissions report submission. For more information regarding which pollutants are considered Greenhouse Gas Pollutants see Help.

Hazardous Air & Greenhouse Gas Pollutant				Emissions Reported			
Pollutant	**Code**	**Type**		**Fugitive Amount**	**Stack Amount**	**Total**	**Units**
Trichloroethylene	79016	VOC-HAP	Locate	10.87	0	10.87	TONs

Printable view Exp or toexcel

Attachments

Attachment ID	Attachment Type	Description	Trade Secret Document	Trade secret Justification	Uploaded By	Upload Date

Printable view Export to excel

Show Me Reporting Steps Excluded/Included Emissions Units Create Revised Rpt

2011

GOODRICH

TRICHLORETHYLENE ADDITIONS

Date of Add	Starting Amount	Ending Amount	Comments	Initials
~~[illegible]~~				
9-9-11	8,050	8255		
9-17-11	8,255	8,340	95 GAL	A. G.
10-6-11	8,340	8,390	50 Gal	RB
11-21-11	8,390	8,490	100 GAL	C. G.
11-27-11	8,490	8,523	33 GAL	SR
12-16-11	8,523	8,560	37 Gal	KB

	Date	Start Meter (gals)	Adds from Tank (gals)	Adds from Drums (gals)	Totals Adds (lbs)	Totals Adds (kgs)	Waste Shipments (lbs)	Waste Shipments (kg)	Cumulative Consumption (lbs)
2011	Jan '11	7,980	0	0	0.0	0.0		0.0	0.0
	Feb	7,980	0	0	0.0	0.0		0.0	0.0
	Mar	7,980	0	0	0.0	0.0		0.0	0.0
	Apr	7,980	0	0	0.0	0.0		0.0	0.0
	May	7,980	0	0	0.0	0.0	304	69.0	-152.0
	Jun	7,980	0	0	0.0	0.0		0.0	-152.0
	Jul	7,980	0	0	0.0	0.0		0.0	-152.0
	Aug	7,980	70	0	849.8	385.6	2,017	457.6	-310.7
	Sep	8,050	290	0	3,520.6	1,597.4	642	145.6	2,888.9
	Oct	8,340	50	0	607.0	275.4		0.0	3,495.9
	Nov	8,390	133	0	1,614.6	732.6		0.0	5,110.5
	Dec	8,523	37	0	449.2	203.8	397	90.1	5,361.2
2012	Jan '12	8,560	90	0	1,092.6	495.7		0.0	1,092.6
	Feb	8,650	346	0	4,200.4	1,905.8		0.0	5,293.0
	Mar	8,996	254	0	3,083.6	1,399.1	6,679	1,515.2	5,037.1
	Apr	9,250	-9,250	0	-112,295.0	-50,950.5	1,214	275.4	-107,864.9
	May				0.0			0.0	-107,864.9
	Jun				0.0			0.0	-107,864.9
	Jul				0.0			0.0	-107,864.9
	Aug				0.0			0.0	-107,864.9
	Sep				0.0			0.0	-107,864.9
	Oct				0.0			0.0	-107,864.9
	Nov				0.0			0.0	-107,864.9
	Dec				0.0			0.0	-107,864.9

ANNUAL VAPOR DEGREASER FOR REPORTING YEAR 2011
VAPOR DEGREASER L003

For: Goodrich Corporation - Plating Operations
Facility ID: 13-18-00-5949

RE: Reporting requirements of Title V Permit to Operate

All operators of the vapor degreaser (Source ID L003) have received training on the proper operation of the solvent cleaning machines and their control devices sufficient to pass the test required pursuant to 40 CFR 60.463(d)(10).

Training has been documented and filed.

The total estimated solvent consumption for reporting year 2011 is 0.9 Tons.

Note: This vapor degreaser system was taken out of service in September, 2010, following the discovery of leaks in the tank. Repair began in June, 2011, and was completed in September, 2011. TCE consumption for 2011 is significant below historical usage rates (approximately 8-10 tons) due to the system being physically out of service for over 9 months, being administratively out of service for an additional month while the process was being recertified by our customers, and because of reduced production demands. Systemic improvements implemented during the repair may demonstrate that the current system is also susceptible to lower evaporative losses than the old system, but at this time, there is not a sufficient amount of data.

CHROME PLATING
SUBPART N

OPERATIONAL AND MAINTENANCE PLAN

Goodrich Aerospace Plating Operation
2800 East 33rd Street
Cleveland, Ohio 44115

Operation & Maintenance Criteria

Hard Chrome Fume Scrubber

Pass	Fail		Equipment	Criteria	Frequency
❑	❑	a)	Nozzles	Uniformity of Spray	Quarterly
❑	❑	b)	Piping	Chemical Attack/Leaks	Quarterly
❑	❑	c)	Mesh Pads	Acid build up/breakthrough	Quarterly
❑	❑	d)	Housing	Chemical Attack	Quarterly
❑	❑	e)	Drains	Check for flow	Quarterly
❑	❑	f)	Remote Tank	Check water level	Quarterly
❑	❑	g)	No Leaks	No leaks	Quarterly

Centrifugal Fan

Pass	Fail		Equipment	Criteria	Frequency
❑	❑	a)	Fan Operation	Is unit running	Quarterly
❑	❑	b)	Stack Vibration	Excessive Stack Motion	Quarterly
❑	❑	c)	Bearings	Need greased	Quarterly
❑	❑	d)	Belts	Tightness/slippage	Quarterly
❑	❑	e)	Guards	In place	Quarterly
❑	❑	f)	Voltage	460 volts	Quarterly

Note that wash down of composite mesh pads occurs once (1) every (8) hours in accordance with manufacturers specifications.

Procedures to Prevent Malfunction(s)

Goodrich Plating Operation will utilize a computerized monitoring system, in accordance with 40CFR 63.343(c)(ii), to alert the appropriate personnel of a malfunction in the scrubber system. This system is located in the Plating Communication room and will alert the user of a fluctuation in the water column pressure across the scrubber system. This fluctuation will alert the user to inspect the scrubber system for malfunction(s) due to poor maintenance.

Once the user is alerted they can read the computer screen to see exactly what time the pressure fluctuation occurred as well as the new pressure reading. This information will be used in reporting purposes and emission determinations.

Goodrich Aerospace Plating Operation
2800 East 33rd Street
Cleveland, Ohio 44115

All pressure drop fluctuations will be addressed by the maintenance department via the facilities manager. Once the determination has been made for the pressure fluctuation the corrective action will be performed to ensure proper working order of the scrubber system.

Systematic Procedure for Identifying Malfunction(s)

Once the computer has alarmed and user has received the information, the following protocol will be met;

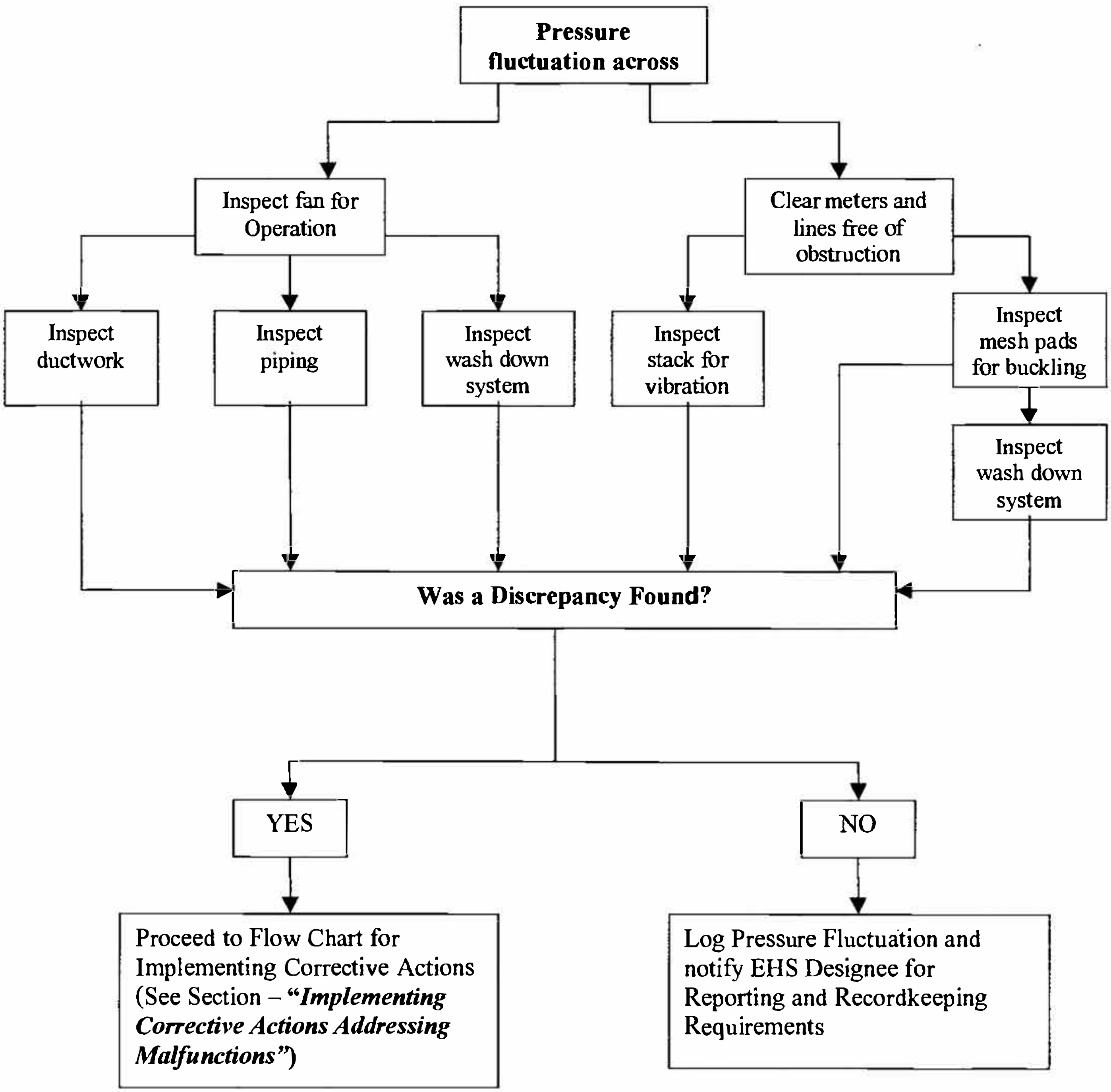
1) The facility's manager will be notified that the fluctuation in the pressure drop across the system has occurred.

2) Go to the control panel to inspect photohelic meters. If the meter is low then inspect the centrifugal fan. However, if the meter is high disconnect photohelic cells and unclog lines; (also inspect the mesh pads for excessive buckling)

3) Inspect the ductwork, pipes, and wash down system for leaks, drips, vibrations and operability.

See Flow Chart Below on Next Page

Goodrich Aerospace Plating Operation
2800 East 33rd Street
Cleveland, Ohio 44115



Goodrich Aerospace Plating Operation
2800 East 33rd Street
Cleveland, Ohio 44115

Implementing Corrective Actions Addressing Malfunction(s)

Discrepancy Identified

↓

Facility Manager & Maintenance Representative Develop and Implement Necessary Corrective Actions.

↓

Facility Manager Documents Corrective Action Taken & Maintenance puts Corrective Action into "COGZ" Preventative Maintenance System.

↓

Facility Manager Notifies the EHS Designee to Ensure Compliance In Reporting and Recordkeeping Requirements

Reporting of the O&M Plan

This plan is being submitted in accordance with 40 CFR 63.342(f)(3) in an effort to assure that procedures specified within are consistent as required by paragraph (f)(3)(i) of 40 CFR 63.342. However, if periods of malfunction are inconsistent, Goodrich Plating Operation shall record the action taken for the event and shall report by phone such actions within two (2) working days after commencing actions inconsistent with the plan.

A letter shall follow the phone report within seven (7) working days after the end of the event, unless Goodrich Plating Operation makes alternative reporting arrangement, in advance, with the Administrator.

Additionally, Goodrich Plating Operation will revise the O&M Plan within 45 days after such an event occurs. The revised plan shall include procedures for operating and maintaining the process equipment, add-on air pollution control device, and monitoring equipment during similar malfunction events, as well as a program for corrective action for such events.

Recordkeeping

The following records will be maintained for not less than five (5) years from the date of completion;

1) All inspection checklists referring to maintenance or operability
2) Maintenance performed on any scrubber equipment
3) Any malfunction report
4) Test reports of performance
5) Measurements for determining performance reports
6) Monitoring data, (i.e. computer pressure drop readings)
7) Excess mission data, (i.e. time, dates, process, equipment..)
8) Total process operating time of the scrubbers during reporting period
9) All records, forms and reports sent to the Ohio EPA or any other regulatory agency

5/14/11 6:00:22 PM Reading from location Chrome North Scrubber is 3.74 , set m
5/14/11 11:00:21 PM Reading from location Chrome North Scrubber is 4.08 , set
6/10/11 5:30:33 AM Reading from location Chrome South Scrubber is 0.45 , set m
6/10/11 11:15:32 AM Reading from location Chrome South Scrubber is 0.28 , set
6/10/11 3:45:31 PM Reading from location Chrome South Scrubber is 0.32 , set m
6/10/11 8:30:30 PM Reading from location Chrome South Scrubber is 0.45 , set m
6/11/11 5:30:28 AM Reading from location Chrome South Scrubber is 0.44 , set m
6/11/11 11:15:27 AM Reading from location Chrome South Scrubber is 0.31 , set
6/11/11 3:45:27 PM Reading from location Chrome South Scrubber is 0.39 , set m
6/11/11 8:30:26 PM Reading from location Chrome South Scrubber is 0.44 , set m
6/12/11 5:30:25 AM Reading from location Chrome South Scrubber is 0.39 , set m
6/12/11 11:15:24 AM Reading from location Chrome South Scrubber is 0.32 , set